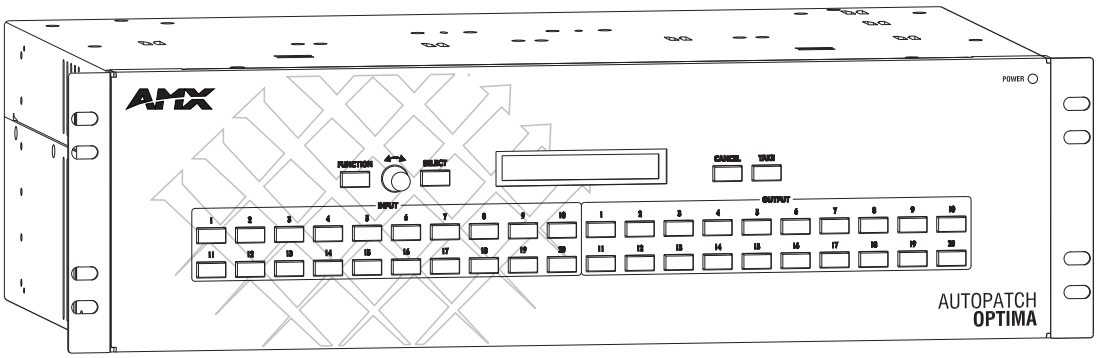
Instruction Manual

Optima

Distribution Matrix



AutoPatch Matrix Switchers

REV G: 1/20/2011

AMX Limited Warranty and Disclaimer

This Limited Warranty and Disclaimer extends only to products purchased directly from AMX or an AMX Authorized Partner which include AMX Dealers, Distributors, VIP's or other AMX authorized entity.

AMX warrants its products to be free of defects in material and workmanship under normal use for three (3) years from the date of purchase, with the following exceptions:

- LCD Panels are warranted for three (3) years, except for the display and touch overlay components are warranted for a period of one (1) year.
- Disk drive mechanisms, pan/tilt heads, power supplies are warranted for a period of one (1) year.
- AMX lighting products are guaranteed to switch on and off any load that is properly connected to our lighting products, as long as the AMX lighting products are under warranty. AMX also guarantees the control of dimmable loads that are properly connected to our lighting products. The dimming performance or quality there of is not guaranteed, due to the random combinations of dimmers, lamps and ballasts or transformers.
- AMX software is warranted for a period of ninety (90) days.
- Batteries and incandescent lamps are not covered under the warranty.
- AMX AutoPatch Epica, Modula, Modula Series 4, Modula Cat Pro Series and 8Y-3000 product models will be free of defects in materials and manufacture at the time of sale and will remain in good working order for a period of three (3) years following the date of the original sales invoice from AMX. The three-year warranty period will automatically be extended to the life of the product (Limited Lifetime Warranty). The life of the product extends until five (5) years after AMX ceases manufacturing the product model. The Limited Lifetime Warranty applies to products in their original installation only. If a product is moved to a different installation, the Limited Lifetime Warranty will no longer apply, and the product warranty will instead be the three (3) year Limited Warranty.

Note: *The complete Warranty is at* ***www.amx.com****.*

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ESD Warning

To avoid ESD (Electrostatic Discharge) damage to sensitive components, make sure you are properly grounded before touching any internal materials.

When working with any equipment manufactured with electronic devices, proper ESD grounding procedures must be followed to ensure people, products, and tools are as free of static charges as possible. Grounding straps, conductive smocks, and conductive work mats are specifically designed for this purpose.

Anyone performing field maintenance on AMX AutoPatch equipment should use an appropriate ESD field service kit complete with at least a dissipative work mat with a ground cord and a UL listed adjustable wrist strap with another ground cord. These items should not be manufactured locally, since they are generally composed of highly resistive conductive materials to safely drain static charges, without increasing an electrocution risk in the event of an accident. ESD protective equipment can be obtained from 3M™, Desco®, Richmond Technology®, Plastic Systems®, and other such vendors.

Important Safety Information and Instructions

When using and installing your AMX AutoPatch product, adhere to the following basic safety precautions. For more information about operating, installing, or servicing your AMX AutoPatch product, see your product documentation.

- Read and understand all instructions before using and installing AMX AutoPatch products.
- Use the correct voltage range for your AMX AutoPatch product.
- There are no user serviceable parts inside an AMX AutoPatch product; service should only be done by qualified personnel.
- If you see smoke or smell a strange odor coming from your AMX AutoPatch product, turn it off immediately and call technical support.
- For products with multiple power supplies in each unit, make sure all power supplies are turned on simultaneously.
- Use surge protectors and/or AC line conditioners when powering AMX AutoPatch products.
- Only use a fuse(s) with the correct fuse rating in your enclosure.
- Make sure the power outlet is close to the product and easily accessible.
- Make sure the product is on or attached to a stable surface.
- Turn off equipment before linking pieces together, unless otherwise specified in that product's documentation.
- For safety and signal integrity, use a grounded external power source and a grounded power connector.
- Turn off and unplug an enclosure before adding or removing boards, unless otherwise specified in that product's documentation.
- To avoid shock or potential ESD (Electrostatic Discharge) damage to equipment, make sure you are properly grounded before touching components inside an AMX AutoPatch product.

Information et directives de sécurité importantes

Veuillez vous conformer aux directives de sécurité ci-dessous lorsque vous installez et utilisez votre appareil AMX AutoPatch. Pour de plus amples renseignements au sujet de l'installation, du fonctionnement ou de la réparation de votre appareil AMX AutoPatch, veuillez consulter la documentation accompagnant l'appareil.

- Lisez attentivement toutes les directives avant d'installer et d'utiliser les appareils AMX AutoPatch.
- Le voltage doit être approprié à l'appareil AMX AutoPatch.
- Les appareils AMX AutoPatch ne contiennent aucune pièce réparable par l'usager; la réparation ne doit être effectuée que par du personnel qualifié.
- Si de la fumée ou une odeur étrange se dégagent d'un appareil AMX AutoPatch, fermez-le immédiatement et appelez le Service de soutien technique.
- Veillez à ce que tous les blocs d'alimentation des appareils dotés de blocs d'alimentation multiples dans chaque unité soient allumés simultanément.
- Servez-vous de protecteurs de surtension ou de conditionneurs de lignes à courant alternatif lorsque vous mettez les appareils AMX AutoPatch sous tension.
- Placez uniquement des fusibles de calibre exact dans les boîtiers.
- Veillez à ce que la prise de courant soit proche de l'appareil et facile d'accès.
- Veillez à ce que votre appareil AMX AutoPatch soit installé sur une surface stable ou qu'il y soit fermement maintenu.
- Fermez toutes les composantes de l'équipement avant de relier des pièces, à moins d'indication contraire fournie dans la documentation de l'appareil.
- Par mesure de sécurité et pour la qualité des signaux, servez-vous d'une source d'alimentation externe mise à la terre et d'un connect d'alimentation mis à la terre.
- Fermez et débranchez le boîtier avant d'ajouter ou d'enlever des plaquettes, à moins d'indication contraire fournie dans la documentation du appareil.
- Pour éviter les chocs ou les dommages éventuels causés à l'équipement par une décharge électrostatique, veillez à ce le dispositif oit bien relié à la terre avant de toucher les composantes se trouvant à l'intérieur d'un appareil AMX AutoPatch.

Notices

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While every precaution has been taken in the preparation of this publication, AMX assumes no responsibility for error or omissions. No liability is assumed for damages resulting from the use of the information contained herein.

Further, this publication and features described herein are subject to change without notice.

US FCC Notice

The United States Federal Communications Commission (in 47CFR 15.838) has specified that the following notice be brought to the attention of the users of this product.

Federal Communication Commission Radio Frequency Interference Statement:

"This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the booklet, How to Identify and Resolve Radio-TV Interference Problems*, prepared by the Federal Communications Commission to be helpful."*

This booklet is available from the U.S. Government Printing Office, Washington, D.C. 20402, Stock N. 004-000-00345-4.

Use shielded cables. To comply with FCC Class A requirement, all external data interface cables and adapters must be shielded.

Lithium Batteries Notice

Switzerland requires the following notice for products equipped with lithium batteries. This notice is not applicable for all AMX equipment.

Upon shipment of products to Switzerland, the requirements of the most up-to-date Swiss Ordinance Annex 2.15 of SR 814.81 will be met including provision of the necessary markings, documents, and annual reports relative to the disposal of the batteries to the Swiss Authorities.

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Warnings and Cautions

This manual uses the following conventions and icons to draw attention to actions or conditions that could potentially cause problems with equipment or lead to personal risk.

ESD Warning: *The icon to the left indicates text regarding potential danger associated with the discharge of static electricity from an outside source (such as human hands) into an integrated circuit, often resulting in damage to the circuit.*

Warning: *The icon to the left indicates text that warns readers against actions or conditions that could cause potential injury to themselves.*

Caution: *The icon to the left indicates text that cautions readers against actions that could cause potential injury to the product or the possibility of serious inconvenience.*

Overview and General Specifications

Applicability Notice

The information in this manual applies to the following Optima pre-engineered systems, custom systems, input/output (I/O) boards, and expansion boards:

Optima Pre-Engineered Systems

All Optima pre-engineered systems are numbered FGP46-xxxx-xxx (e.g., FGP46-0808-007).

Optima Custom Systems

All custom Optima systems contain one or more of the following enclosure models:

Enclosure Size and Part #	
3 RU	FG1046-10
2 RU	FG1046-13

Optima Input/Output Boards

A single enclosure can handle a combination of signals (such as analog audio, analog video, sync, digital video, DVI, etc.) depending on the number and type of input/output (I/O) boards. Optima 2 RU enclosures have four board slots while Optima 3 RU enclosures have six board slots. (A double-connector board fills two board slots and has two rows of connectors; see page 13.)

For information on the specific I/O boards in your system, including connector types, cabling/wiring directions, specifications, and any special considerations, see the applicable board chapter in this manual (chapter title specifies the board's signal type).

The following tables provide configuration sizes and part numbers for boards that are sold individually for custom systems. Pre-engineered systems will also contain boards from these tables.

Optima Video I/O Boards and Part #		
Signal	**Configuration**	**Part #**
Standard Video (BNC Connectors)	8x8	FG1046-440
	16x16	FG1046-485
	16x24	FG1046-545
	20x4	FG1046-470
	20x20	FG1046-413
	24x4	FG1046-515
	24x16	FG1046-431
	36x4	FG1046-422
S-Video (S-Video Connectors)	8x8	FG1046-446
	16x16	FG1046-488
Y/c (BNC Connectors)	8x8	FG1046-476

Optima Video I/O Boards and Part # (Continued)		
Signal	**Configuration**	**Part #**
Wideband Video (300 MHz) (BNC Connectors)	8x8	FG1046-437
	16x16	FG1046-482
	16x24	FG1046-542
	20x4	FG1046-467
	20x20	FG1046-410
	24x4	FG1046-503
	24x16	FG1046-428
	36x4	FG1046-419
HV Sync (BNC Connectors)	8x8 HV (Hi-Z) (dual BNCs)	FG1046-443
	16x16 (Hi-Z)	FG1046-569
	16x24 (Hi-Z)	FG1046-566
	20x4 (Hi-Z)	FG1046-563
	20x20 (Hi-Z)	FG1046-560
	24x4 (Hi-Z)	FG1046-557
	24x16 (Hi-Z)	FG1046-554
	36x4 (Hi-Z)	FG1046-551
RGBHV/HD-15 Wideband Video (300 MHz)	4x2	FG1046-530
	8x4	FG1046-497
	8x8	FG1046-536
	15x15	FG1046-593
SD-SDI (BNC Connectors)	4x4	FG1046-527
	8x8	FG1046-491
HD-SDI (BNC Connectors)	8x8	FG1046-590
DVI* (DVI-I Connectors)	4x4	FG1046-479
	8x8	FG1046-659
HDMI**	8x8	FG1046-614

* The DVI boards are not HDCP compliant at this time.

** The HDMI board is HDCP 1.3 compatible.

Optima Analog Audio I/O Boards and Part #		
Signal	**Configuration**	**Part #**
Stereo Audio (Pluggable 5-Position Terminal Block Connectors)	8x4	FG1046-539
	8x8	FG1046-494
	16x16	FG1046-533
	16x24	FG1046-548
	20x4	FG1046-473
	20x20	FG1046-416
	24x4	FG1046-500
	24x16	FG1046-434
	36x4	FG1046-425

Optima Digital Audio I/O Boards and Part #		
Signal	**Configuration**	**Part #**
S/PDIF (coaxial)	8x8	FG1046-458
TosLink (optical)	8x8	FG1046-455
Four S/PDIF plus four TosLink	8x8	FG1046-461

Optima CatPro I/O Boards and Part #		
Signal	**Configuration**	**Part #**
RGBHV+Stereo (RJ-45 Connectors)	4x8	FG1046-581
	8x8	FG1046-575

Note: *CatPro boards are used in conjunction with CatPro RX (Receiver) FG1010-48-01.*

Optima Expansion Boards

If you ordered Optima expansion boards (which add additional functionality to the system), they were installed at the factory. For information on expansion boards, including connectors and cabling/wiring directions, see the specific expansion board's chapter in this manual.

Optima Expansion Boards and Part #	
Board Type	**Part #**
APWeb (TCP/IP) – 3 RU only	FG1046-313
XNNet – 2 RU only	SA1046-310

Product Notes

An Optima Distribution Matrix can stand alone or be linked as part of a larger system, including any other AMX AutoPatch products that are XNNet compatible. The Optima is available in a variety of input to output configuration sizes and can contain audio, video, and data boards in the same enclosure.

An Optima system can fit in a broad range of analog and digital environments and is controllable from a variety of sources (see page 15).

Note: *Because the Optima Distribution Matrix is available in several models and various configurations, the illustrations in this manual may differ from the model(s) you purchased.*

Optima Features

- Ultra-Flat Response – bandwidth curve measured at a tight ±3 dB
- High bandwidth-linearity and low crosstalk
- Superior video crosstalk specifications ensure signal isolation and security
- System self-diagnostics
- Supports full Device Discovery through AMX's AutoPatch Duet module (firmware v1.4.0 or higher is required)
- Ability to mix a variety of video, audio, and data boards in a single enclosure
- Virtual matrices (levels) / groupings
- Audio breakaway to route audio-follow-video, video, or audio alone
- RJ-45 Ethernet (Enc Link) port for linking enclosures
- Global presets

Optima Features (continued)

- Local presets allow quick recall of a pre-programmed set of switches with a single command; multiple presets can exist within a system at the same time
- Ships with free AMX AutoPatch matrix switcher configuration software, XNConnect
- Standard RS-232 (Control) port
- Board upgrade potential
- Optional expansion boards with a TCP/IP port (3 RU only) or an XNNet port (2 RU only)
- Volume control (standard audio) on each output
- Audio connections support balanced and unbalanced audio
- Rack mounting ears included
- Backed by AMX 3 year warranty (see warranty at **www.amx.com** or on the *AMX AutoPatch CD*)

Optima HDMI Features (for systems with 8x8 HDMI boards)

- True 8x8 HDMI matrix switching, allowing any input to be switched to any or all outputs
- HDMI 1.3a compatible
- HDCP 1.3 compatible
- AMX HDCP InstaGate® technology significantly reduces the HDCP latency and interruptions of protected content on all displays in the system
- Supports computer video up to 1900x1200
- Supports HDTV up to 1080p
- Pre-loaded with the most common EDID settings to ensure proper functionality with source devices
- Features our EDID Programmer allowing specific display EDID settings to be custom loaded on each input

Optima Control Features

Optima systems support three different protocols: BCS* (Basic Control Structure), XNNet, and TCP/IP. Several different control options are available. Multiple control methods can be used on the same system.

- Front mounted or remote control panel options (with front panel security lockout)
- AMX Control Devices – for control programming information, see the *Instruction Manual* for the specific interface
- APControl 3.0.1 software – free with all systems to provide easy single-user PC control of the matrix switcher
- APWeb – optional TCP/IP control via an APWeb expansion board (3 RU enclosure only) or external APWeb module (for 2 RU or 3 RU enclosures)
- Supports AMX AutoPatch's simple BCS serial control protocol
- Remote link port – for direct connection with remote control panels and SBC control pads
- Supports third-party controllers

* BCS is sent as ASCII characters through the Control (RS-232) port. For information on BCS commands, see the *Instruction Manual – BCS Basic Control Structure Protocol* on the *AMX AutoPatch CD* or at **www.amx.com**.

Note: *Features and specifications described in this document are subject to change without notice.*

Front View

The enclosure, which is the structural basis of the Optima Distribution Matrix, is available in many convenient pre-engineered sizes or can be custom built for your installation. An Optima enclosure may have either a front control panel (CP-15 or CP-20A) or a blank front panel.

Although control panels are optional, we recommend one per system for system verification, redundant control, and troubleshooting. Control panel illustrations and directions for use are provided in the specific *Instruction Manual* for the control panel (available on the *AMX AutoPatch CD* or at **www.amx.com**). For additional control options, see page 15.

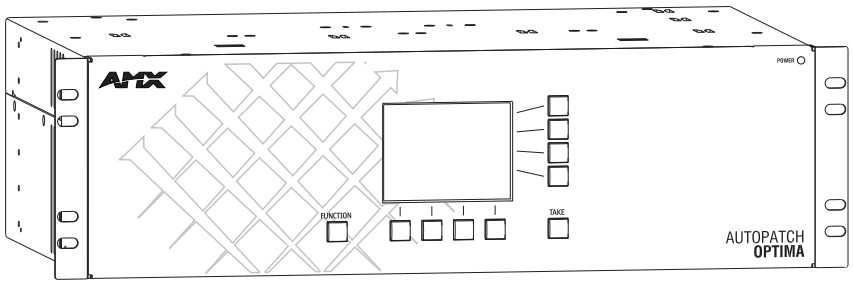


FIG. 1 Optima enclosure with CP-20A Control Panel

Rear View

The enclosure's appearance, as viewed from the rear (FIG. 2 and FIG. 3), will vary depending on the configuration and signal types.

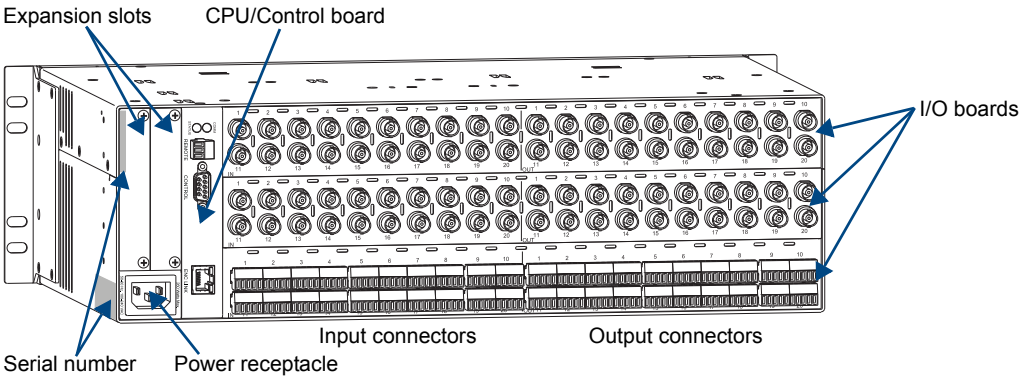


FIG. 2 Optima 3 RU rear view

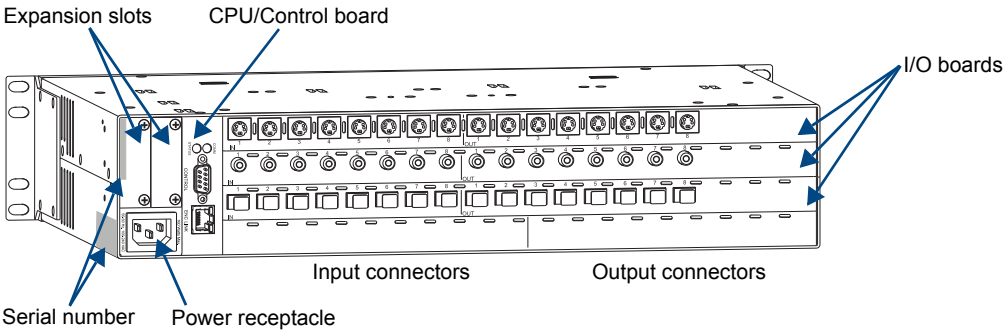


FIG. 3 Optima 2 RU rear view

Rear View Components

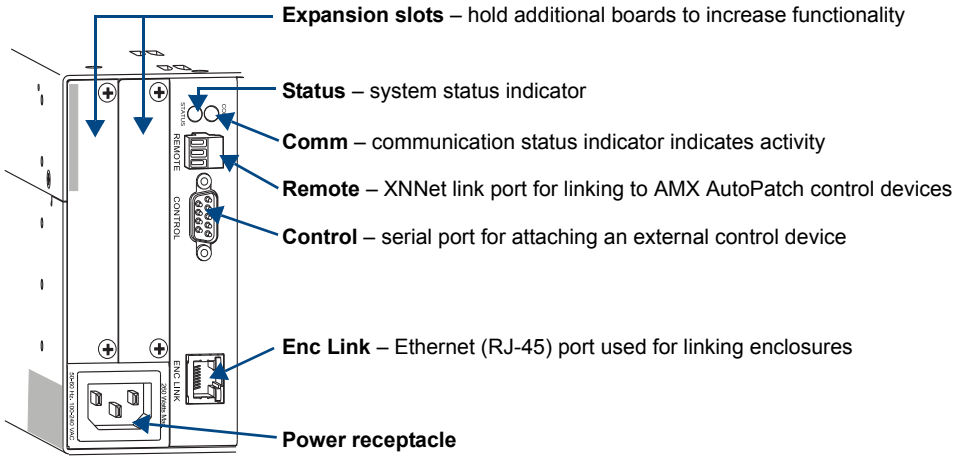
- CPU/Control board
- Power receptacle and specifications
- Input/output boards (number will vary depending on enclosure size, and slots may be empty depending on the configuration)
- Two expansion/control slots (may contain boards for communication interfaces, etc.)
- Serial number

The following sections briefly introduce the hardware on the rear of the enclosure.

CPU/Control Board

The CPU is to the left of the input connectors on the rear of the enclosure (FIG. 4).

Optima 3 RU


Expansion slots – hold additional boards to increase functionality
Status – system status indicator
Comm – communication status indicator indicates activity
Remote – XNNet link port for linking to AMX AutoPatch control devices
Control – serial port for attaching an external control device
Enc Link – Ethernet (RJ-45) port used for linking enclosures
Power receptacle
REMOTE
CONTROL
ENC LINK

Optima 2 RU

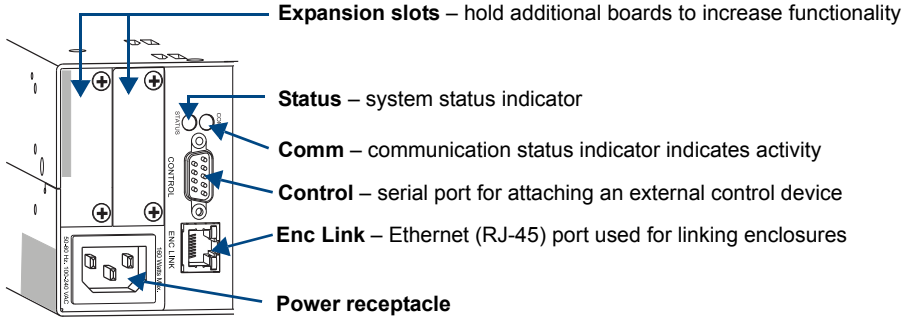

Expansion slots – hold additional boards to increase functionality
Status – system status indicator
Comm – communication status indicator indicates activity
Control – serial port for attaching an external control device
Enc Link – Ethernet (RJ-45) port used for linking enclosures
Power receptacle
CONTROL
ENC LINK

FIG. 4 Optima CPU/Control boards and power receptacles

CPU Port Options:

- Remote Port – XNNet communication link port for linking to AMX AutoPatch control devices (e.g., remote control panels and SBCs). The Remote port is standard on 3 RU enclosures and available as an expansion board on 2 RU enclosures.
- Control Port – serial port (RS-232) for attaching an external control device
- Enc Link Port – Ethernet (RJ-45) port used for linking enclosures in multiple-enclosure systems (do *not* use as a TCP/IP connection)

Power Receptacle

The universal power receptacle is in the lower left hand corner on the rear of the enclosure (FIG. 4). Maximum power specifications are on the power receptacle. The power receptacle will accept all major international standard power sources. (Standard US power cords are provided for installations within the US.)

The fuse is internal and is not field serviceable. If you believe the fuse needs to be replaced, contact technical support (see page 38).

Input/Output Boards

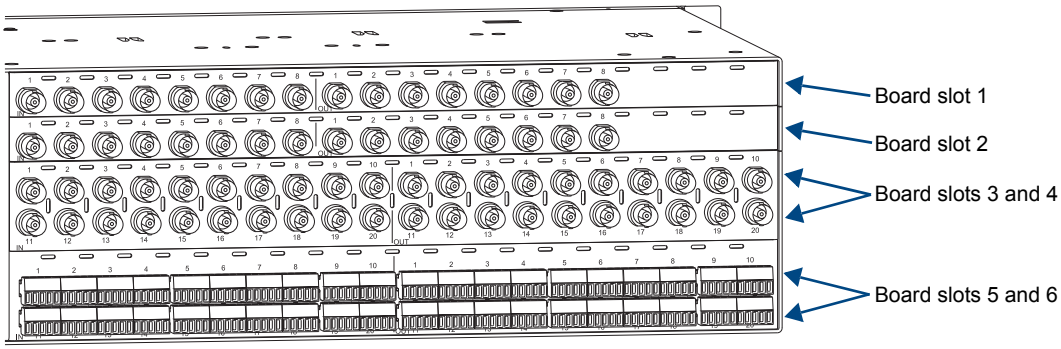


FIG. 5 Input/output boards in an Optima 3 RU enclosure

A single enclosure can handle a combination of signals (such as analog audio, analog video, sync, digital video, DVI, etc.) depending on the number and type of input/output boards. Optima 2 RU enclosures have four board slots while Optima 3 RU enclosures have six board slots. A double-connector board fills two board slots and has two rows of connectors.

For information on the boards included in your system, including connector types, cabling/wiring directions, and specifications, see the specific board chapter in this manual (the chapter title specifies the board's signal type).

Input and Output Connectors

Input and output connectors are the attachment points for source and destination devices that connect to the system. Viewed from the rear of the enclosure, the inputs (sources) are on the left side of each board, and the outputs (destinations) are on the right side of the board. The BNC connectors are color coded; the white connectors are inputs and the black connectors are outputs.

Input and output connectors are numbered separately on each board and read left to right. The numbers are either directly above or below the connector (or connector pair, e.g., H and V connectors). This numbering pattern continues on each board (FIG. 5).

For control purposes, signals can only be routed from inputs on one board to outputs on the same board because each board in an Optima has its own switching matrix.

Expansion/Control Slots

Each enclosure has two expansion/control slots (FIG. 4 on page 12) for expansion boards to increase functionality and add new features to your system, e.g., an XNNet board for an Optima 2 RU enclosure or an APWeb board (Optima 3 RU) for control over a LAN. If expansion boards are part of the original system, the boards are installed at the factory. For information on expansion boards, including connectors and cabling/wiring directions, see the specific expansion board's chapter in this manual.

System Serial Number

The system's serial number is normally located in two places on the enclosure.

When viewed from the rear, one serial number label is on the left expansion plate (FIG. 4 on page 12). The second serial number label is on the left side of the enclosure at the bottom edge near the power receptacle. The label on the side will also have the enclosure number (referred to as the chassis number). A single enclosure will be labeled "Chassis 1 of 1"; in a multiple-enclosure system, the enclosures will be labeled "Chassis 1 of 3", etc.

Before installation, we recommend recording the system's serial number in an easily accessible location.

Optima General Specifications

General Specifications	
Parameter	**Value**
Approvals	CE, UL, cUL, US FCC Class A, RoHS
Humidity	0 to 90% non-condensing
Operational Temperature	32° F to 110° F (0° C to 43° C)
Storage Temperature	-22° F to 158° F (-30° C to 70° C)
MTBF	92,000 hrs.
2 RU Enclosures	
AC Power*	100 VAC to 240 VAC, single phase (50 Hz to 60 Hz) 1.8 A @ 100 VAC to 240 VAC max.
Power Consumption (max.)	260 Watts
Power Consumption (typical)	110 Watts fully loaded enclosure
Thermal Dissipation (max.)	887 BTU/hr.
Thermal Dissipation (typical)	375 BTU/hr., fully loaded enclosure
Dimensions Depth Width with mounting ears Width without mounting ears Height	 12 in. (30.5 cm) 18.9 in. (48.0 cm) 17.4 in. (44.2 cm) 3.5 in. (8.9 cm)
Weight	Approximately 10 lb. (4.54 kg) per loaded enclosure
3 RU Enclosures	
AC Power*	100 VAC to 240 VAC, single phase (50 Hz to 60 Hz) 3.3 A @ 115 VAC max. 1.6 A @ 230 VAC max.
Power Consumption (max.)	260 Watts
Power Consumption (typical)	150 Watts fully loaded enclosure
Thermal Dissipation (max.)	887 BTU/hr.
Thermal Dissipation (typical)	512 BTU/hr., fully loaded enclosure
Dimensions Depth Width with mounting ears Width without mounting ears Height	 12 in. (30.5 cm) 18.9 in. (48.0 cm) 17.4 in. (44.2 cm) 5.2 in. (13.2 cm)
Weight	Approximately 12 lb. (5.44 kg) per loaded enclosure

* The fuse is internal and is not field serviceable. If you believe the fuse needs to be replaced, contact technical support (see page 38).

For individual board information and specifications, see the specific board chapter in this manual.

AMX reserves the right to modify its products and their specifications without notice.

Configuration Information and Control Options

Configuration Information

The configuration of an Optima system specifies routing and control information for that particular model (for model information, see the "Applicability Notice" on page 7). Most Optima systems use 3 virtual matrices for switching signals: VM 0 = audio-follow-video, VM 1 = video, and VM 2 = audio. Custom systems may vary depending on the installation requirements.

Important: *Unless you need to modify the system, you will not need to use XNConnect.*

If necessary, XNConnect configuration software can be used to modify a system's configuration information (see page 119). XNConnect is provided on the *AMX AutoPatch CD* shipped with each system. Options for modifying the configuration include basic tasks, such as creating local presets, setting the control panel password (CP-15 Control Panels only), and customizing input and output channel names for control display (e.g., in an APWeb interface).

Control Options

Optima systems support three different protocols: BCS (as ASCII characters sent through the Control / RS-232 port), XNNet, and TCP/IP. Several different control options are available, and multiple control methods can be used on the same system.

Front Control Panel or Remote Control Panel

AMX AutoPatch control panels, either front or remote, control an Optima's switches and attributes. Although control panels are optional, we recommend one per system for routing verification, redundant control, and troubleshooting. If the system has a control panel, see the applicable *Instruction Manual* for the control panel on the *AMX AutoPatch CD* or at **www.amx.com**.

AMX Control Devices

The Optima is compatible with a number of AMX control devices. For control programming information, see the *Instruction Manual* for the specific interface.

AMX Control Software

Optima enclosures can be controlled using AMX AutoPatch software:

- APControl 3.0 – for control and scheduling
  - Uses Control (serial) port located on the CPU
  - Runs on a PC connected to the Control port
  - Download* from the *AMX AutoPatch CD*
- APWeb Server (TCP/IP) – for control, diagnostics, and third-party access
  - Uses an APWeb expansion board or uses the Control port located on the CPU for connecting to an APWeb Server Module
  - Accessed through a TCP/IP interface, such as, a web browser (e.g., Internet Explorer)
  - Contact AMX regarding limitations and conditions for operating an Optima on a company LAN (Local Area Network)

* If your AMX account has the required permissions, you can download APControl from **www.amx.com**.

BCS Serial Control Protocol

The Optima can be controlled with an external serial controller that sends and receives ASCII characters via its Control (RS-232) serial port. AMX AutoPatch has developed a command language, BCS (Basic Control Structure) protocol, for programming control operations and for diagnostic purposes. BCS commands can be entered into a terminal emulation program (e.g., HyperTerminal) running on a PC. For information on BCS commands, see the *Instruction Manual – BCS Basic Control Structure Protocol* on the *AMX AutoPatch CD* or at **www.amx.com**.

Third-Party Controllers

A third-party controller can also be attached to an Optima enclosure. If using a third-party controller, see the controller documentation for operating instructions.

Note: *Advanced programmers who want to design their own control programs can use AMX's AutoPatch XNNet protocol. The "AMX AutoPatch CD" includes the XNNet Communication Library, an interface library that supports C, Java, and Visual Basic and has examples of the XNNet protocol in use.*

System Diagnostics

For system diagnostics, the Optima uses a programmer's interface, which displays in a splash screen.

Programmer's Interface for System Diagnostics

The Optima displays system information in its splash screen for diagnostic purposes. The information indicates the current status and well-being of the system components. The splash screen can be accessed using a terminal emulation program (e.g., HyperTerminal). For information on the programmer's interface, see "Appendix B" on page 131.

Installation and Setup

Site Recommendations

When placing the enclosure, follow the recommendations and precautions in this section to reduce potential installation and operation hazards.

Environment

- Choose a clean, dust free, (preferably) air-conditioned location.
- Avoid areas with direct sunlight, heat sources, or high levels of EMI (Electromagnetic Interference).
- To make control panel operations easier, mount the enclosure with the control panel in the rack at eye level.

Chassis Accessibility

Make sure the front and rear panels of the enclosure are accessible, so that you can monitor the LED indicators. Leaving adequate clearance at the rear will also allow for easier cabling and service.

Power

The source's electrical outlet should be installed near the router, easily accessible, and properly grounded. Power should come from a building branch circuit. We recommend using a dedicated line for the system's power. Use a minimum breaker current rating of 15 A for 110 V or 30 A for 230 V.
To avoid an overload, note the power consumption rating of all the equipment connected to the circuit breaker before applying power.

General Hazard Precautions

These recommendations address potential hazards that are common to all installations:

Elevated Operating Temperature

The maximum rated ambient temperature for Optima enclosures is 110° F (43° C).

All equipment should be installed in an environment compatible with the manufacturer's maximum rated ambient temperature. In a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than the ambient room temperature.

Caution: *To protect the equipment from overheating, do not operate in an area that exceeds 110° F (43° C) and follow the clearance recommendation below for adequate airflow.*

Airflow Restriction

Optima enclosures are designed to adequately dissipate the heat they produce under normal operating conditions; however, this design is defeated when high heat producing equipment is placed directly above or below an enclosure.

Caution: *To prevent overheating, avoid placing high heat producing equipment directly above or below the enclosure. The system requires a minimum of one empty rack unit above and below (three empty rack units are recommended). Verify that the openings on the sides of the enclosure are not blocked and do not have restricted air flow.*

Mechanical (Rack) Loading

When installing equipment in a rack, distribute the weight to avoid uneven mechanical loading.

Circuit Overloading

When connecting the equipment to the supply circuits, be aware of the effect that overloading the circuits might have on over-current protection and supply wiring.

Reliable Earthing (Grounding)

Reliable earthing of rack-mounted equipment should be maintained. If not using a direct connection to the branch circuit (e.g., plugging into a power strip), pay particular attention to supply connections.

Caution: *For proper start up, turn on all power switches for the AMX AutoPatch equipment at the same time before applying power to the source and destination devices. We recommend attaching all power cords to a surge protector and/or an AC line conditioner.*

Unpacking

The Optima is shipped with one enclosure per shipping box. The invoice is sent separately; a packing slip is attached to the outside of each box. Each box contains the following items:

- ❑ Enclosure
- ❑ Standard US power cord (if shipped within the US)
- ❑ Rack ears (with 8 screws)
- ❑ Link cables (provided with multiple-enclosure systems)
- ❑ Other enclosure products as needed

The documentation in the first box includes:

- ❑ AMX AutoPatch Optima Quick Start Guide
- ❑ AMX AutoPatch Linking Enclosures Quick Start Guide (for multiple-enclosure systems)
- ❑ *AMX AutoPatch CD*
- ❑ AutoPatch Connector Guide

The shipping boxes are marked as "Chassis __ of __," where the first blank is the box number and the second blank is the total number of boxes in the shipment.

Important: *If applicable, the shipping boxes each have a bright yellow/green sticker that states that the unit (enclosure) is part of a multiple-enclosure system and must be installed with the same serial numbers.*

Unpacking Tips

- ❑ Before fully unpacking the enclosure(s), *inspect the shipping box(es) for any signs of damage*. If a box is partially crushed or any sides have been broken open, notify the shipping agency immediately and contact your AMX representative (see the warranty on the *AMX AutoPatch CD* or at **www.amx.com**).
- ❑ Once unpacking is complete, closely check the physical condition of the enclosure.
- ❑ Collect all documentation.

Note: *Please save the original shipping container and packing materials. AMX is not responsible for damage caused by insufficient packing during return shipment to the factory. Shipping boxes are available; contact your AMX representative for details.*

Rack Installation and System Setup

The Optima Distribution Matrix enclosure can be mounted in a standard EIA 19 in. (48.26 cm) rack. Rack installation ears are included, and directions for mounting the rack ears are included in the rack installation instructions (see page 20).

Important: *The system requires at least one empty rack unit above and below the enclosure to allow adequate airflow; three empty rack units are recommended.*

Required items for rack installation:

- ❑ Enclosure(s)
- ❑ Standard EIA 19 in. (48.26 cm) rack
- ❑ Rack ears (with 8 screws per set)
- ❑ Screwdriver
- ❑ Screws that fit your rack for mounting the enclosure(s)
- ❑ Power cord(s)
- ❑ Link cables and equipment (included with multiple-enclosure systems)

Optional items for rack installation:

- ❑ Surge-protector(s) – highly recommended
- ❑ A laptop computer or PC with a null modem cable (for communication with the Optima via its Control / RS-232 port)

Installation Recommendations

- Write the system's serial number in an easily accessible location before installing the Optima in a rack. The system's serial number is located in two places on the enclosure: on the left rear and on the left side of the enclosure near the power receptacle.
- Use an earth-grounded power cord / system with the Optima.
- Attach all power cords to a single surge protector and/or an AC line conditioner.
- Apply power to the Optima enclosure(s) before applying power to its source and destination devices.

Installation Procedure

A flow chart showing the installation sequence is in FIG. 6. The procedure following provides general steps with references to detailed information found in later sections of the manual.

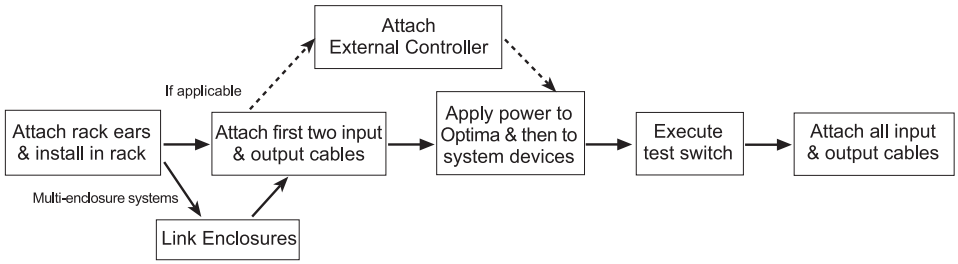


FIG. 6 Installation procedure

Caution: *To prevent overheating and airflow restriction, avoid placing high heat producing equipment directly above or below the enclosure. The system requires a minimum of one empty rack unit above and below (three empty rack units are recommended). Verify that the openings on the sides of the enclosure are not blocked and do not have restricted air flow*

To install and set up an Optima system in a rack:

1. Attach the rack ears per FIG. 7.

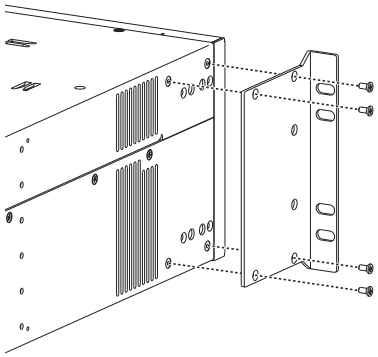


FIG. 7 Attach rack ears to sides of enclosure

2. Place the enclosure in the rack and attach front-mounting screws to hold it firmly in place (repeat for any additional enclosures).

Tip: *When placing enclosures, keep in mind that the optimal viewing angle for a control panel is eye level.*

3. Multiple-enclosure systems – Link them according to the information starting on page 22.

4. Attach *only* the first two source and destination devices; see "Attaching Inputs and Outputs" on page 32 and the "AutoPatch Connector Guide" (shipped with each system).*
Do not apply power to the devices until after the Optima has power (Step 6).

5. Enclosures with blank front panels – Establish communication with an external control device; see "Attaching External Controllers" on page 28. (This step is optional for enclosures with front control panels.)

* If the installation includes 8x8 DVI boards or 8x8 HDMI boards, see page 21 for additional setup information.

6. Apply power to the system according to the power-up procedure; see "Applying Power and Startup" on page 33.

Note: *We recommend using a surge protector and/or an AC line conditioner.*

7. Execute a test switch to be sure the system is working properly; see "Executing a Test Switch" on page 36.
8. When the test switch works correctly, attach the remaining source and destination devices.

Installation Options

Additional installation tasks may include creating the following:

- Custom channel names – See page 125 in "Appendix A – Managing Configuration Files."
- Local presets – See page 126 in "Appendix A – Managing Configuration Files."
- Global presets – See the *Instruction Manual – BCS Basic Control Structure Protocol* on the *AMX AutoPatch CD* or at **www.amx.com**.

8x8 DVI Installation

If the system contains 8x8 DVI boards, additional setup information may apply.

- If necessary, EDID Programmer software is available for re-programming DVI 8x8 boards (see page 155). The EDID Programmer is located on the *AMX AutoPatch CD* (also available at **www.amx.com**).
- If using the four high-amperage output connectors on an 8x8 DVI board to power the first four destination devices, see page 67.

8x8 HDMI Installation

If the system contains 8x8 HDMI boards, additional setup information may apply.

- We recommend priming the system for InstaGate® technology, which will significantly reduce the HDCP latency (see page 81).
- If necessary, EDID Programmer software is available for re-programming the HDMI boards (see page 155). The EDID Programmer is located on the *AMX AutoPatch CD* (also available at **www.amx.com**).

Linking Enclosures

Linking enclosures allows control information to pass between them. Optima enclosures are linked using the Enc Link (Ethernet) ports* on the CPU boards; the Ethernet traffic between these ports maintains consistent control speed. In a multiple-enclosure system, the enclosure with the control panel or external controller receives control information and passes on relevant information to the other enclosures via the links.

Important: *If applicable, the shipping boxes each have a bright yellow/green sticker that states that the unit (enclosure) is part of a multiple-enclosure system and must be installed with the same serial numbers.*

Important: *The Enc Link (Ethernet RJ-45) connector on the CPU is not for a TCP/IP connection.*

* The Optima Ethernet RJ-45 port is labeled "Enc Link." On other AMX AutoPatch enclosures, the Link port (BNC or RJ-45) may be labeled "Link A," "Link 1," or "10/100."

Caution: *AMX AutoPatch systems should only be linked in their own isolated networks.*

If any of the linked enclosures were not part of the original system, contact technical support (see page 38) for important information not included here.

An Optima can be linked directly to another Optima, an Optima SD, a Precis SD, an Epica DG, Epica DGX 32, or Epica DGX 144 enclosure with the appropriate cable because they all use Ethernet 10Base-T (10/100) connectors for linking (see page 24).

An Optima can be linked to 10Base-2 enclosures (e.g., Modula, Modula CatPro, Epica-128, or Epica-256 enclosures) using a 10Base-T to 10Base-2 Media (Ethernet) Converter and cables (see page 25).

A switch (or hub) is required to link systems that include at least three Optima enclosures, or include two Optima enclosures and at least one other enclosure with a 10Base-T connector, or include one Optima enclosure and two or more enclosures with 10Base-T connectors (see page 26).

Network Segments

The network segments (the physical network sections as determined by hardware) of a linked system determine the total distance between all the enclosures in a linked system. A switch/hub or a media converter indicates the start of a new network segment. For more information regarding network segments, see the directions for the individual type of system. 10Base-T (RJ-45) network segments cannot exceed 100 ft. (30.5 m). 10Base-2 (BNC) network segments cannot exceed 10 ft. (3.05 m).

Important: *Enclosures must be cabled correctly after linking. To ensure that the correct signal cables are attached to the correct enclosure, check the "AutoPatch Connector Guide" that shipped with the system, as well as the system / enclosure numbers on the rear of each enclosure.*

Enclosures and Ethernet Connectors

The method used for linking depends on the type of Ethernet connector on each enclosure's CPU. The table below indicates the type of Ethernet connectors available on AMX AutoPatch enclosures.

Enclosure	Ethernet 10Base-T (RJ-45)	Ethernet 10Base-2 (BNC)
Optima & Optima SD	●	
Epica DG, Epica DGX 32, & Epica DGX 144	●	
Epica-128 & Epica-256		●
Modula & Modula CatPro		●
Precis SD	●	

Note: *The Ethernet RJ-45 port may be labeled Enc Link, Link A, Link 1, or 10/100 for 10Base-T.*

Link Cables and Equipment

AMX provides link cables and equipment for enclosures that are ordered as part of a linked system. The link cables and equipment are also available for customers who want to link enclosures that were not originally ordered to do so. For details, contact your AMX representative.

Link Cables and Equipment in Optima Linked Systems				
Enclosure →	**Cable →**	**Converter →**	**Cable →**	**Enclosure**
Optima	RJ-45 crossover	–	–	Optima & Optima SD
Optima	RJ-45 crossover	–	–	Epica DG, Epica DGX 32, & Epica DGX 144
Optima	RJ-45 straight-through patch	Media Converter	RG-58 coax	Epica-128 & Epica-256
Optima	RJ-45 straight-through patch	Media Converter	RG-58 coax	Modula & Modula CatPro
Optima	RJ-45 crossover	–	–	Precis SD

Link Cables and Equipment List

- **RJ-45 Crossover Cable**: use to connect 10Base-T enclosures to a Media Converter or to a Multi-Port Switch (also used for direct linking between 10Base-T enclosures). The cable is wired to TIA/EIA-568-A on one end and TIA/EIA-568-B on the other end.
- **RJ-45 Straight-Through Patch Cable**: use to connect a 10Base-T enclosure to a Media Converter or to a Multi-Port Switch. Both ends of the cable are wired to TIA/EIA-568-A.
- **RG-58 Coax Cable**: use to connect a 10Base-2 (BNC) enclosure to a Media Converter (also used to daisy chain 10Base-2 enclosures).
- **Media Converter**: use when linking 10Base-T (RJ-45) enclosures to 10Base-2 (BNC) enclosures.
- **Multi-Port Switch**: use when linking some types of multiple-enclosure systems.

Ethernet Connector LEDs

The 10Base-T Ethernet (RJ-45) connector on the Optima CPU has two LEDs that indicate communication status when the enclosure is linked to an active system (FIG. 8).

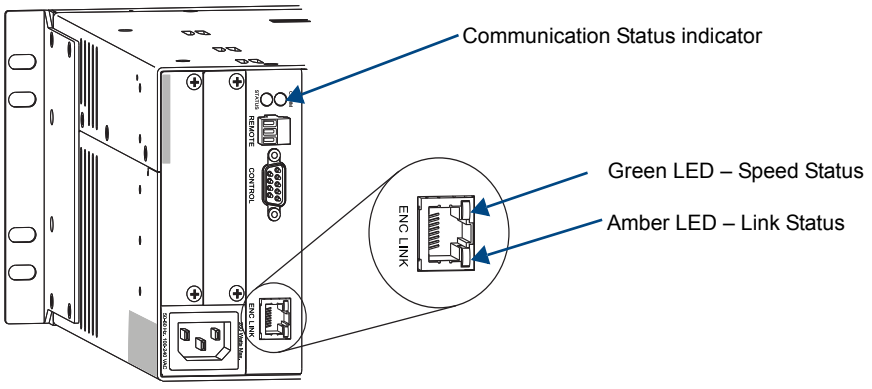


FIG. 8 Ethernet connector LEDs

The LEDs indicate the following:

- Green LED *on* – speed status is 100 Mbps
- Green LED *off* – speed status is 10 Mbps
- Amber LED *on* – link status is active

Note: *The Comm (Communication Status) indicator at the top of the CPU board indicates communication status when the enclosure is linked as part of an active system.*

Linking an Optima to Another Enclosure with an RJ-45 Ethernet Port

An Optima can be directly linked to another Optima, an Optima SD, a Precis SD, an Epica DG, an Epica DGX 32, or an Epica DGX 144 via the RJ-45 Ethernet ports.

The total distance between the two linked enclosures cannot exceed 100 ft. (30.5 m).

Cable Length Requirements

Network Segment	Cable Type	Maximum Distance
Optima to Optima or Optima SD or Precis SD or Epica DG or Epic DGX 32 or Epica DGX 144	RJ-45 crossover	100 ft. (30.5 m)

To link an Optima to another enclosure with an RJ-45 Ethernet port:

1. Insert one end of the crossover cable into the first Optima's Enc Link (RJ-45) port.
2. Insert the other end of the crossover cable into the Enc Link (RJ-45) port on the second Optima (Optima SD, Precis SD, Epica DG, Epica DGX 32, or Epica DGX 144).

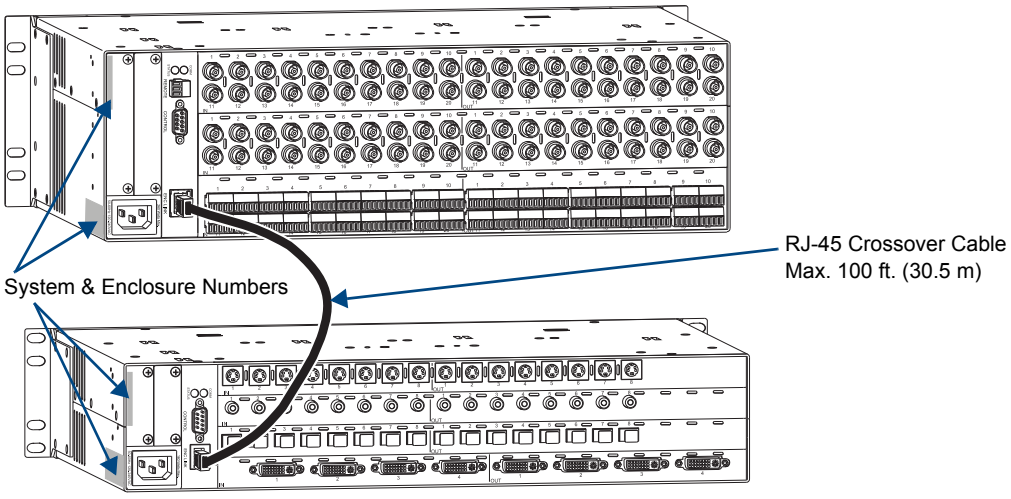


FIG. 9 Optima 3 RU linked to an Optima 2 RU

When power is applied, the Ethernet connector LEDs illuminate indicating communication status (see page 23).

Linking an Optima to an Enclosure with a BNC Ethernet Port

An Optima enclosure can be linked to an enclosure with an Ethernet 10Base-2 connector (Modula, Modula CatPro, Epica-128, or Epica-256) by using a Media Converter. Additional 10Base-2 enclosures can be daisy-chained off the first one.

Important: *The total distance between the two end terminators in a multiple-enclosure system cannot exceed 10 ft. (3.05 m).*

Cable Length Requirements

Network Segment	Cable Type	Maximum Distance
Optima to Media Converter	RJ-45 straight-through patch	100 ft. (30.5 m)
Media Converter to last enclosure in daisy chain	RG-58 coax	10 ft. (3.05 m) total

Important: *Attach 50-ohm termination connectors to the open ends of the T-connectors on the Media Converter and on the last enclosure of the cable run.*

To link an Optima to an enclosure with a BNC Ethernet port:

1. Insert the RJ-45 straight-through patch cable into the Optima enclosure's Enc Link (RJ-45) port.
2. Insert other end of the cable into the Media Converter's 10/100 (RJ-45) port.
3. Fasten a T-connector to the Media Converter's BNC connector.
4. Attach an RG-58 coax cable to the T-connector.
5. Add a 50-ohm termination connector to the other end of the T-connector.
6. Fasten a T-connector to the Ethernet 10Base-2 (BNC) connector on the second enclosure's CPU.
7. Attach the other end of the RG-58 coax cable to the T-connector.
8. If applicable – Attach additional enclosures with T-connectors and RG-58 coax cables.
9. Add a 50-ohm termination connector to the open end of the T-connector on the last enclosure of the cable run.

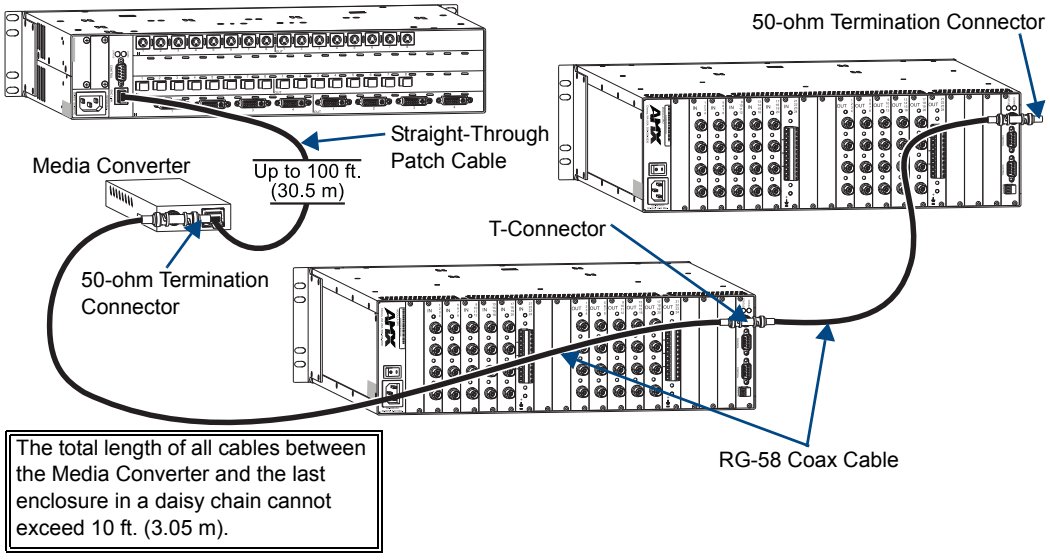

50-ohm Termination Connector
Straight-Through Patch Cable
Media Converter
Up to 100 ft. (30.5 m)
T-Connector
50-ohm Termination Connector
The total length of all cables between the Media Converter and the last enclosure in a daisy chain cannot exceed 10 ft. (3.05 m).
RG-58 Coax Cable

FIG. 10 Optima 2 RU linked to two Modula enclosures

When power is applied, the Ethernet connector LEDs illuminate (see page 23).

Linking an Optima Using a Media Converter and Multi-Port Switch

Linking an Optima enclosure to multiple other types of enclosures (other than linking in a daisy chain off an enclosure with a 10Base-2 / BNC connector) requires a Multi-Port Switch and RJ-45 straight-through patch cables. Depending on the other types of enclosures, a Media converter(s) and RG-58 coax cable(s) may also be required. FIG. 11 shows a system with two Optima enclosures and a Modula enclosure linked using a 5-Port Switch and a Media Converter.

Cable Length Requirements

Network Segment	Cable Type	Maximum Distance
Optima to Multi-Port Switch	RJ-45 straight-through patch	100 ft. (30.5 m)
Multi-Port Switch directly to another type enclosure	RJ-45 straight-through patch	100 ft. (30.5 m)
Multi-Port Switch to Media Converter	RJ-45 straight-through patch	100 ft. (30.5 m)
Media Converter to last enclosure in daisy chain	RG-58 coax	10 ft. (3.05 m) total

Note: *If you have questions regarding cabling or network related issues in conjunction with using a Multi-Port Switch (or hub) for linking enclosures, contact your network administrator.*

When attaching multiple enclosures to a Multi-Port Switch, one or more can be connected directly to the Multi-Port Switch (see steps below) and/or one or more can use a Media Converter to connect to the Multi-Port Switch (see steps on page 27). In a system with multiple 10Base-2 enclosures, only one needs to be attached to the Multi-Port Switch with a Media Converter. The rest can be daisy-chained.

To link an Optima enclosure to a Multi-Port Switch:

1. Insert one end of the RJ-45 straight-through patch cable into the Enc Link (RJ-45) Ethernet port on the Optima enclosure.
2. Insert the other end of the RJ-45 straight-through patch cable into the Multi-Port Switch.
3. Repeat Steps 1 and 2 for enclosures with 10Base-T ports.* For 10Base-2 ports, see page 27.**

* Applies when linking an Optima, an Optima SD, a Precis SD, or an Epica DG to a Multi-Port Switch.

** Applies when linking a Modula, Modula CatPro, Epica-128, or Epica-256.

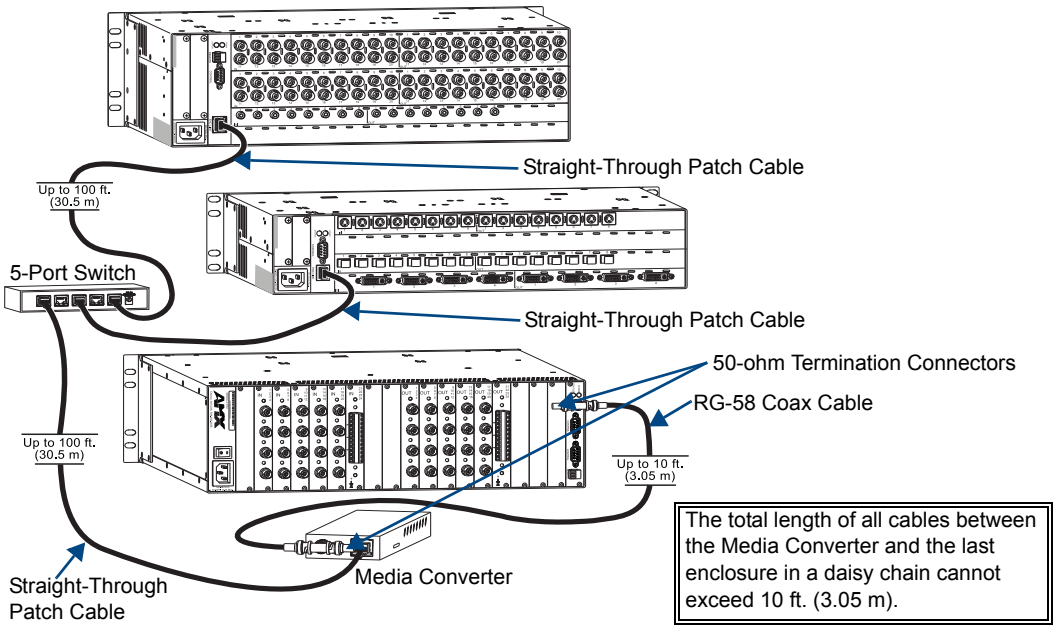

Straight-Through Patch Cable
Up to 100 ft. (30.5 m)
5-Port Switch
Straight-Through Patch Cable
50-ohm Termination Connectors
RG-58 Coax Cable
Up to 100 ft. (30.5 m)
Up to 10 ft. (3.05 m)
The total length of all cables between the Media Converter and the last enclosure in a daisy chain cannot exceed 10 ft. (3.05 m).
Straight-Through Patch Cable
Media Converter

FIG. 11 Two Optima enclosures linked to a Modula enclosure

Important: *Attach 50-ohm termination connectors to the open ends of the T-connectors on the Media Converter and on the last enclosure on the cable run.*

To link enclosures* with a BNC Ethernet connector to a Multi-Port Switch:

1. Fasten a T-connector to the Ethernet BNC connector on the enclosure's CPU.
2. Attach an RG-58 coax cable to the T-connector.
3. If applicable – Attach additional enclosures with T-connectors and RG-58 coax cables.**
4. Add a 50-ohm termination connector to the open end of the T-connector on the last enclosure of the cable run.
5. Fasten a T-connector to the Media Converter's BNC connector.
6. Attach the other end of the RG-58 coax cable to the T-connector on the Media Converter.
7. Add a 50-ohm termination connector to the open end of the T-connector on the Media Converter.
8. Insert one end of the RJ-45 straight-through patch cable into the 10/100 (RJ-45) Ethernet port on the Media Converter.
9. Insert the other end of the RJ-45 straight-through patch cable into the Multi-Port Switch.

When power is applied to the enclosures, the Ethernet connector LEDs illuminate indicating communication status (see page 23).

* Applies to Modula, Modula CatPro, Epica-128, and Epica-256 enclosures.

** The total length of all RG-58 coax cables between the Media Converter and the last enclosure in the daisy chain cannot exceed 10 ft. (3.05 m).

Attaching External Controllers

The Optima can be controlled by attaching an external control device that uses one of the communication protocols listed below:

- **BCS (Serial)** – ASCII sent over a null modem serial cable via the serial port
- **XNNet** – AMX AutoPatch protocol via all ports (including serial); AMX AutoPatch control and accessory devices connect via the Remote (XNNet) connector
- **TCP/IP** – See the "APWeb Expansion Board" chapter on page 107 or the APWeb Server Module's documentation on the *AMX AutoPatch CD* and at **www.amx.com**

Important: *The Enc Link (Ethernet RJ-45) connector on the CPU is not for a TCP/IP connection. This port is used for linking enclosures (see page 22).*

External Control Options

The communication protocols listed above are used for these control options:

AMX Control Devices

The Optima is compatible with a number of AMX control devices. For control programming information, see the *Instruction Manual* for the specific interface.

AMX AutoPatch Remote Control Panels and SBCs

AMX AutoPatch remote control panels and other AMX AutoPatch control devices (SBC, Preset SBC, etc.) can connect to the Remote port on the CPU board. For instructions for attaching an external controller to the Remote port, see page 31. For specific information on a remote control device, see its product documentation.

APControl 3.0 (Serial)

APControl 3.0 software (for control and scheduling) runs on a PC connected to an Optima via the Control port and is available on the *AMX AutoPatch CD*.

APWeb (TCP/IP)

The APWeb Server (for control, diagnostics, and third-party access) is accessed through a TCP/IP interface, such as, a web browser (e.g., Internet Explorer). An APWeb expansion board **or** an APWeb Server module is required for APWeb. For setup information, see the "APWeb Expansion Board" chapter on page 107 or the APWeb Server Module's documentation on the *AMX AutoPatch CD* or at **www.amx.com**.

Important: *Contact AMX regarding limitations and conditions for operating an Optima on a company LAN.*

XNNet Protocol (Serial)

Advanced programmers who want to design their own control programs can use AMX AutoPatch XNNet protocol. The *AMX AutoPatch CD* includes the XNNet Communication Library, an interface library that supports C, Java, and Visual Basic and has examples of the XNNet protocol in use.

BCS (Serial) Control

AMX AutoPatch has developed a command language, BCS (Basic Control Structure), for executing control operations and for diagnostic purposes. BCS commands are issued via a terminal emulation program (e.g., Windows® HyperTerminal). For information on BCS commands, see the *Instruction Manual – BCS Basic Control Structure Protocol* on the *AMX AutoPatch CD* or at **www.amx.com**.

Third-Party Controllers (Serial)

Third-party controllers connect to the Control port (DB-9) on the CPU. If using a third-party controller, see the controller documentation for setup and operating instructions.

Attaching Serial Controllers

An external serial controller is any device that can send and receive ASCII code over an RS-232 (null modem) serial cable attached to the Control port on the rear of the enclosure. PCs are common serial controllers. Once a PC is attached to the Optima, the system can be controlled by running APControl software on the attached PC (see the *AMX AutoPatch CD*). The system can also be controlled by entering BCS commands into a terminal emulation program (e.g., HyperTerminal). For information on BCS commands, see the *Instruction Manual – BCS Basic Control Structure Protocol* on the *AMX AutoPatch CD* or at **www.amx.com**.

PC Requirements for APControl 3.0

- ❑ Windows XP Professional® or Windows 2000®
- ❑ Java Runtime Environment (JRE): v1.4.2 or the latest version
- ❑ Minimum Hardware: 166 MHz, 128 MB RAM, 20 MB free disk space, 800x600 display
- ❑ Recommended Hardware: 2.0 GHz, 512 MB RAM, 20 MB free disk space, 1280x1024 display
- ❑ Serial port

PC Requirements for BCS

- ❑ Windows XP Professional® or Windows 2000®
- ❑ Terminal emulation program
- ❑ Serial port

To establish external serial control over a null modem serial cable:

1. Use a null modem cable that matches the pin diagram in FIG. 12 for RS-232 without hardware flow control. AMX AutoPatch equipment requires pins 2, 3, and 5 only.

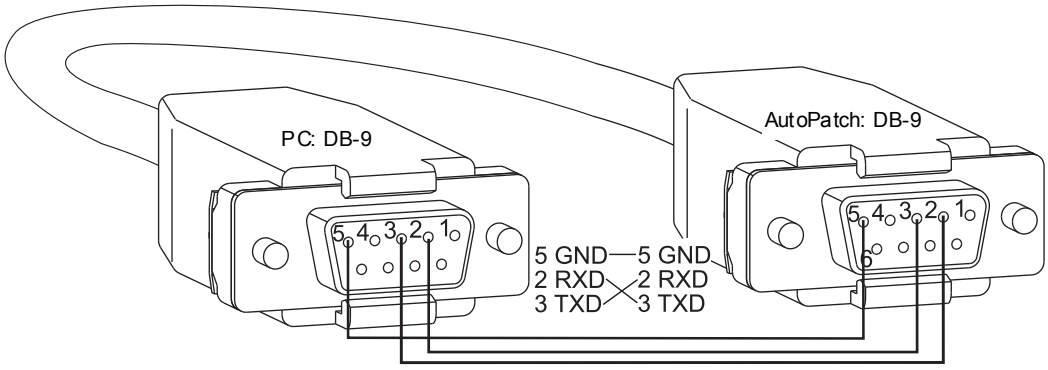


FIG. 12 RS-232 null modem pin diagram, no hardware flow control

2. Plug one end of the null modem serial cable into the Control (RS-232) port on the enclosure (FIG. 13).

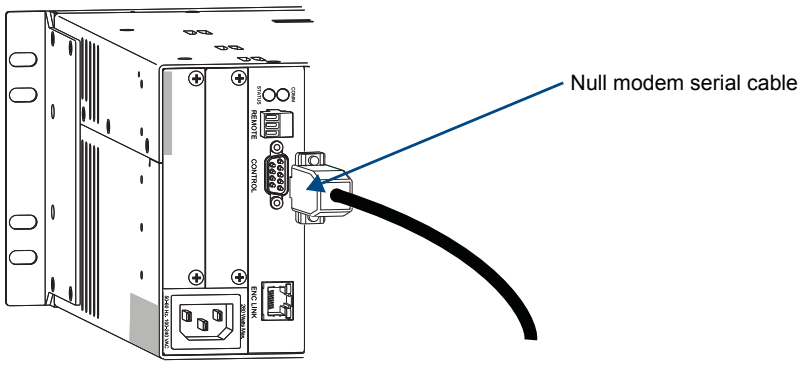


FIG. 13 Attach null modem serial cable to serial port

3. Plug the other end of the serial cable into the serial port on the PC (or serial controller/device).

4. Open the serial communication software and set the PC's port settings to match the Optima default port settings (see table to the right). In addition to the default baud rate of 9600, Optima enclosures support baud rates of 19200, 38400, and 57600. The settings on the PC serial communication software and the enclosure *must* correspond to each other. If a change is required to make them match, changing the PC's settings is preferable. If you decide to change the enclosure's settings instead, use XNConnect (see the Help file).

Optima Serial Port Settings	
Baud Rate	9600
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

Caution: *To avoid system damage, follow the power-up sequence on page 33. We recommend attaching all power cords to a surge protector and/or AC line conditioner.*

5. If not already on, apply power first to the Optima enclosure and then to the source and destination devices (see "Applying Power and Startup" on page 33).

6. Set up and run the desired method of control:

   - **AMX control devices** – See the *Instruction Manual* for the specific interface.
   - **APControl 3.0** – Install and open the program from the *AMX AutoPatch CD* (if your AMX account has the required permissions, the program can be downloaded from **www.amx.com**). Follow the setup wizard and open the APControl Launchbar.
   - **APWeb** – See the "APWeb Expansion Board" chapter on page 107.
   - **Terminal emulation (HyperTerminal)** – Open the program (typically at start/Programs/Accessories/Communications/HyperTerminal), select the COM port, and check that the settings match those in the Optima Serial Port Settings table (see above). If the COM port settings do not match, enter the applicable values from the table.
     Click OK.
     Cycle power on the Optima.
     A short splash screen appears.

7. Execute a test switch to ensure the Optima is working properly (see "Executing a Test Switch" on page 36).

Attaching Remote XNNet Control Devices

A remote XNNet control device is any device that sends and receives XNNet protocol over the Remote port. AMX AutoPatch XNNet control devices include remote control panels (e.g., the CP-15 and CP-20A), as well as Single Bus Controllers (SBCs) and Preset SBCs.

The instructions below are for attaching a device to the Remote port, which is located on the CPU board (3 RU enclosures) or on the XNNet Expansion board (2 RU enclosures). For specific product information, see the individual device's documentation.

Communication Cable Requirements

- ❑ A two-conductor, 20 AWG, 7/28 strand cable with a drain wire or shield, such as Alpha 2412C (customer supplied)
- ❑ Maximum length of cable: 1,000 ft. (305 m) total, including linked panels

To establish a Remote port connection with an XNNet device:

1. Attach one end of the XNNet link cable to the corresponding port on the device (see the individual product documentation).
2. On the Optima's CPU, unplug the Remote connector.
3. Loosen the screws on the Remote connector.
4. Insert the two wires of the XNNet link cable from the device into the Remote connector leaving the center slot empty (FIG. 14).
   Note that either wire can be inserted into either of the outer slots.

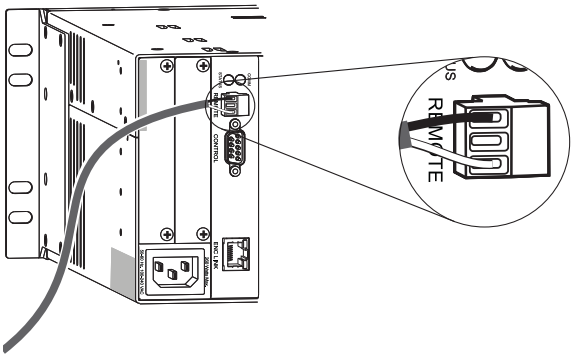


FIG. 14 Insert wires into XNNet connector on the CPU

5. Tighten both screws and plug the connector back into the CPU.
6. If not already on, apply power first to the Optima enclosure before applying power to the XNNet device (see "Applying Power and Startup," page 33).
7. Execute a switch to ensure the Optima is working properly (see "Executing a Test Switch," page 36).

Attaching Input and Output Cables

Input and output connectors are the attachment points for source and destination devices that connect to the system. Viewed from the rear of an Optima enclosure, the inputs (for sources) are on the left side of each board, and the outputs (for destinations) are on the right side of the board. Video BNC connectors are color coded; the white connectors are inputs and the black connectors are outputs.

The number and type of connectors depend on the number and type of input/output boards. Input and output connectors are numbered separately. The connector numbers for each board read left to right and are either directly above or below the connector (or connector pair). This numbering pattern continues on each board (FIG. 15).

For control purposes, signals can only be routed from inputs on one board to outputs on the same board because each board in an Optima has its own switching matrix.

When attaching input and output signal cables, refer to the sheet labeled “AutoPatch Connector Guide” that ships with the system. The guide shows where to attach each signal cable on the rear of each enclosure. The system’s serial number is in two places on the Optima enclosure: left rear and left side near the power receptacle. The label on the side also has the enclosure number, referred to as the chassis number. Follow the guide exactly; the system was programmed at the factory to operate *only* as indicated on the “AutoPatch Connector Guide.”

Before connecting all input and output cables, attach only the first two inputs and outputs and execute a test switch; see page 36. When the test switch is successful, attach the rest of the input and output cables.

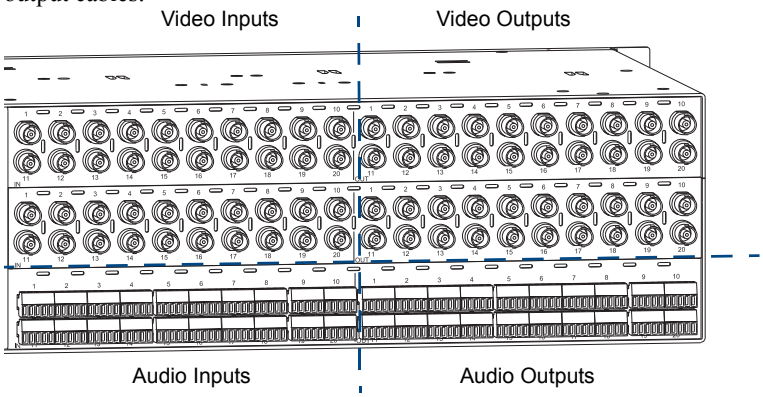


FIG. 15 Numbering starts at the left for each input and output section

Signal Types and Connectors

Signal types and connectors for an Optima enclosure could include those listed in the table below.

Signal Type	Connector Type
Analog video (composite)	BNC
S-Video	S-Video
Y/c	BNC
RGBHV	HD-15
Wideband Video (300 MHz)	BNC
DVI-D	DVI-I
HDMI (Content Protected)	HDMI
Digital video (HD-SDI & SD-SDI)	BNC
Analog audio – stereo (balanced or unbalanced)	Pluggable 5-position terminal block
Digital audio – S/PDIF & TosLink	Coaxial (RCA) & optical

For signal specifications and information on cabling/wiring specific types of connectors, see the applicable board chapter in this manual.

Applying Power and Startup

The universal power receptacle on the enclosure will accept all major international standard power sources. Standard US power cords are provided for installations within the US. Maximum power specifications are on the power receptacle (also listed on page 14). Always use an earth-grounded power cord / system with an Optima.

The source electrical outlet should be installed near the Optima, easily accessible, and properly grounded. Power should come from a building branch circuit. We strongly recommend using a dedicated line for the system's power. Use a minimum breaker current rating of 15 A for 110 V or 30 A for 230 V. To avoid an overload, note the power consumption rating of all the equipment connected to the circuit breaker before applying power.

Caution: *To avoid system damage, turn on all power switches for the AMX AutoPatch equipment at the same time before applying power to the system's source and destination devices. We recommend attaching all power cords to a surge protector and/or an AC line conditioner.*

Power-Up Sequence

To apply power:

1. Attach the first two source and destination devices (see "Attaching Inputs and Outputs," page 32). *Do not apply power* to the source and destination devices until Step 7.
2. Blank front panels – Attach an external controller (see "Attaching External Controllers," page 28). (This step is optional for enclosures with front control panels.)
3. Plug the power cord into the power receptacle on the enclosure (repeat for multiple-enclosure systems).
4. Plug the other end of the power cord(s) into a power strip (we recommend a 30 A power strip) *that is turned off*.
5. Turn on the power strip (to all enclosures if applicable).
   The Power Indicator on the front of the enclosure(s) illuminates.
6. If applicable – Apply power to any external control device/system.
7. Apply power to the source and destination devices.
   The Comm indicator on the front of the enclosure(s) blinks green to indicate Ethernet traffic on the system.

For startup information on specific types of control *before* executing a test switch, see page 28.
The system is ready for a test switch. See "Executing a Test Switch" on page 36.

Note: *For information on checking the software and hardware version, see page 133.*

Control Panel Startup

After applying power and turning on the enclosure(s), the LCD on the control panel illuminates and displays the menu screen. FIG. 16 and FIG. 17 illustrate examples of control panel startup screens. The system is ready for a test switch (see page 36).

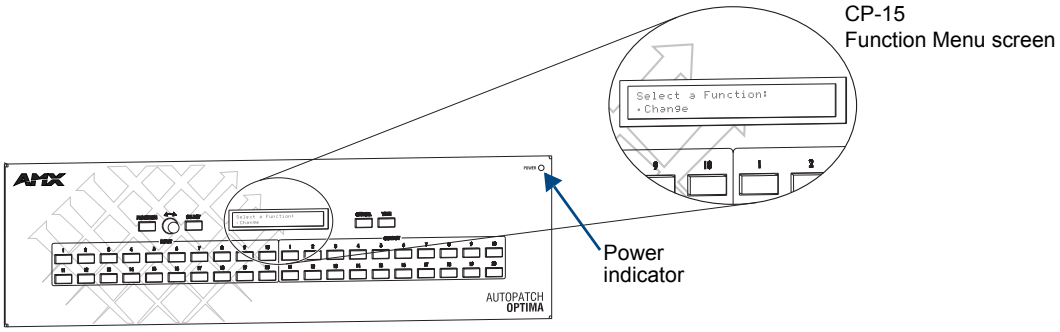


FIG. 16 CP-15 startup screen

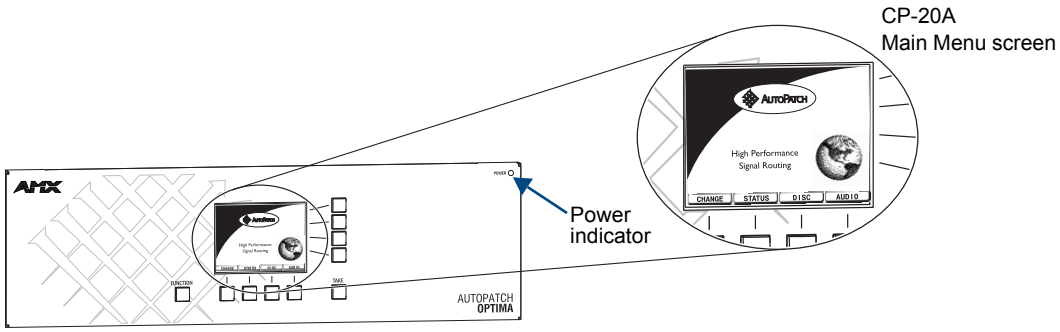


FIG. 17 CP-20A startup screen

Note: *For instructions on checking the software version, see the applicable control panel's "Instruction Manual."*

Serial Control Device Startup

If you have not already done so, attach the serial control device to the Control port on the enclosure (see page 28) and open the control program.

AMX Control Devices

The Optima is compatible with a number of AMX control devices. For control programming information, see the *Instruction Manual* for the specific interface.

APControl 3.0

If you are using APControl 3.0, install and open the program. Follow the directions in the setup wizard. From the Launchbar menu, select Views / CrossBar and click on the crosspoints to execute switches.

APWeb

For startup information, see the "APWeb Expansion Board" chapter (see page 107) or the *APWeb Server Module* documentation.

HyperTerminal

When power is applied to the enclosure, HyperTerminal displays a short splash screen followed by "`Ready`" (FIG. 18). The system is ready to execute a test switch (see page 36).

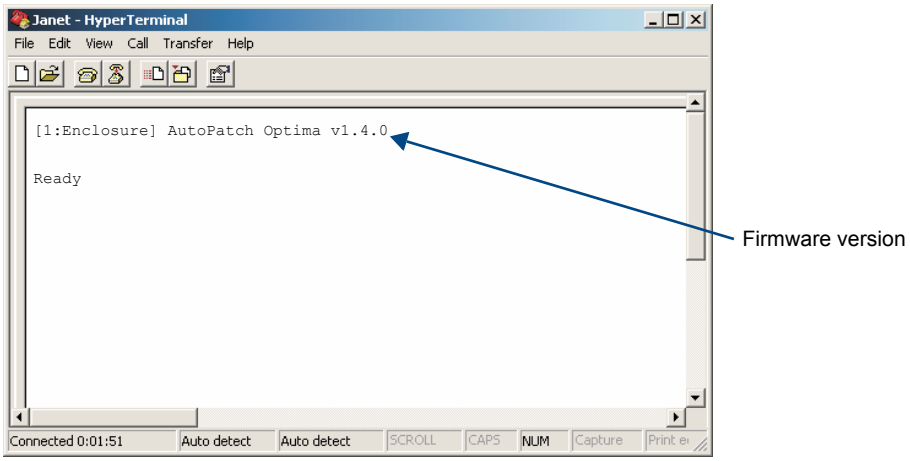


FIG. 18 Power-up splash screen in HyperTerminal

Optima models display advanced system information when diagnostic BCS commands are entered; see "Appendix B – Programmer's Interface for System Diagnostics" on page 131.

For additional information on checking the firmware version, see page 133.

Note: *AMX reserves the right to add to the contents of the splash screen at any time, without notice.*

Executing a Test Switch

Execute a test switch to verify the system is working properly before attaching *all* inputs and outputs. Aside from having signal cables (and a controller if applicable) attached, the system is ready to execute switches when it ships from the factory.

The first two source and destination devices *must* be attached to the input and output connectors as indicated in the "AutoPatch Connector Guide" that is shipped with each system (for specific board connector information and specifications, see the applicable board chapter in this manual). After the devices are connected, power *must* be applied to the enclosure and then to the devices before executing a test switch.

Note: *If the signal from the source or destination device is a component signal that requires being attached to multiple input or output connectors (e.g., an RGsB signal that requires three connectors), all of the signal cables for that signal must be attached before executing the test switch.*

A test switch can be executed from the following:

- Front or remote control panel
- AMX control device
- AMX control software, such as APControl 3.0 or APWeb
- BCS (Basic Control Structure) commands over an external controller
- External third-party controller

Before executing the test switch, make sure the first two source devices and the first two destination devices are connected to the input and output connectors exactly as shown on the "AutoPatch Connector Guide" that is shipped with each system. Depending on the signal type (e.g., component signals), you may need to attach multiple input and output cables.

Note: *Since each board in an Optima has its own switching matrix, signals can only be routed from inputs on one board to outputs on the same board.*

When executing a test switch, we suggest routing Input (source) 1 to Output (destination) 2 on the virtual matrix or level indicated on the "AutoPatch Connector Guide."

HDMI I/O Board – Executing a Test Switch

For HDMI boards, the system stores sink information when a switch is executed and retains that information even after the switch is disconnected. Therefore, we recommend becoming familiar with how HDMI switching works in an Optima by reading the "HDMI I/O Board" chapter (see page 69) before executing a test switch. Then execute the test switch to verify the system is working correctly, disconnect the test switch, and clear the sink key cache (see page 83) before finishing the installation.

Control Panel

Directions for executing switches using the control panel specific to your system can be found in the applicable *Instruction Manual* for that control panel on the *AMX AutoPatch CD* or at **www.amx.com**. Depending on the control panel, the term *virtual matrix* or *level* may appear on the LCD screen. When controlling an Optima, these terms are interchangeable.

AMX Control Device

For executing and disconnecting switches using an AMX control device, see the specific control device documentation.

APControl 3.0 or APWeb

Directions for executing and disconnecting switches using APControl 3.0 are found in its Help file. For directions for executing switches using APWeb, see the *Instruction Manual – APWeb Interface*.

BCS Commands

To enter BCS commands, the system *must* be attached to a serial control device (see "Attaching External Controllers" on page 28) running a terminal emulation program (e.g., Windows® HyperTerminal). The settings on the PC serial communication software and the enclosure *must* correspond to each other. For setting information, see the table on page 30.

When using HyperTerminal, command characters are entered and sent to the enclosure's CPU (the command characters appear in HyperTerminal when the enclosure responds). When all of the entered characters appear in HyperTerminal, the command has been successfully executed.

The following test switch routes Input 1 to Output 2 on Level 0 (or use the level indicated on your system's "AutoPatch Connector Guide").

To execute a test switch using BCS commands:

1. Enter the following BCS command line:
   `CL0I1O2T`

When the "`T`" appears, the system has successfully executed the command. If any other characters appear, the command was not successful. Verify that the source signal is present (visible and/or audible) at the destination.

For a complete list of BCS commands and responses, see the *Instruction Manual – BCS Basic Control Structure Protocol* on the *AMX AutoPatch CD* or at **www.amx.com**.

DVI I/O Board (8x8 only)

After a test switch for an 8x8 DVI board has executed successfully, the image may need to be adjusted with the EDID Programmer software that is provided on the *AMX AutoPatch CD* or at **www.amx.com** (see page 155).

Installation Troubleshooting

If the test switch did not execute correctly:

- ❑ Check the power indicator on the front of the enclosure.
  If it is not illuminated, check the power cords.
- ❑ Verify the status of the test switch.
  If using BCS commands, enter "`SL0O2T`".
  If "`SL0O2T(1)`" appears, the test switch is routed.
  If the status returns as routed correctly, the system established a connection between the specified input and output connectors within the enclosure.
- ❑ Check all link and signal connections on the rear of the enclosure(s) to make sure everything is physically set up correctly.
- ❑ Check all power switches on the source and destination devices to make sure they are all turned on.
- ❑ Check all signal connections on the source and destination devices to make sure everything is physically set up correctly.
- ❑ Isolate source and destination equipment and cable problems by patching around the router using barrel connectors or cable adapters to check the overall signal path.
- ❑ Attempt the switch again.
  If the switch still does not work, contact technical support (see page 38).

Technical Support

Before contacting technical support with a question, please consult this manual. If you still have questions, contact your AMX representative or technical support. Have your system's serial number ready. The system's serial number is normally located in two places on the enclosure: on the left rear and on the left side near the power receptacle.

We recommend recording your system's serial number in an easily accessible location.

AMX Contact Information

- 3000 Research Drive, Richardson, TX 75082
- 800.222.0193
- 469.624.8000
- Fax 469.624.7153
- Technical Support 800.932.6993
- www.amx.com

Standard Video I/O Boards

Applicability Notice

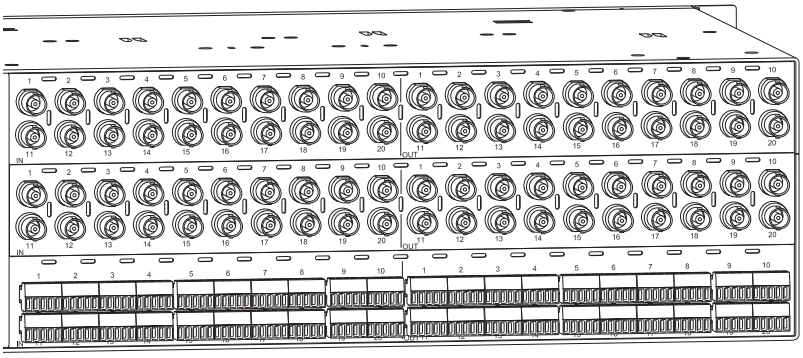


FIG. 19 Standard video input/output boards (with a stereo audio board)

This chapter pertains to Optima standard video input/output boards contained in pre-engineered systems and custom systems. The table below provides information on the types of standard video boards and their part numbers.

Standard Video I/O Boards	
Note: *Specifications for the following boards are listed on page 40.*	
Configuration	**Board Part #**
8x8	FG1046-440
16x16	FG1046-485
16x24	FG1046-545
20x4	FG1046-470
20x20	FG1046-413
24x4	FG1046-515
24x16	FG1046-431
36x4	FG1046-422

Standard Video I/O Boards Specifications

Applies to I/O boards FG1046-413, FG1046-422, FG1046-431, FG1046-440, FG1046-470, FG1046-485, FG1046-515, and FG1046-545.

These boards come in a number of pre-engineered systems or can be ordered individually for custom systems.

Specifications		
Parameter	**Conditions**	**Value**
Frequency Response	1 to All	±3 dB to 50 MHz or better ±1 dB to 15 MHz or better
Crosstalk (adjacent channel)	f = 5 MHz	<-60 dB
Differential Gain*	f = 3.58 MHz	<0.2% or better
Differential Phase*	f = 3.58 MHz	<0.2º or better
Signal to Noise Ratio (SNR)	Vin = 0.7 V, 100 IRE	>65 dB
Input Level (max.)		±2.5 V
Input Impedance		75 ohms
Output Level (max.)		±2.5 V
Output Impedance		75 ohms
Connector Type		BNC

* Differential gain and phase measurements are performed with a standard 5-step modulated staircase test signal.

AMX reserves the right to modify its products and their specifications without notice.

Attaching Cables

When attaching standard video input and output cables, refer to the sheet labeled “AutoPatch Connector Guide” that ships with the system. The sheet shows where to attach each cable on the rear of each enclosure. Follow the sheet exactly; the system was programmed at the factory to operate *only* as indicated on the sheet. For multiple-enclosure systems, each enclosure will be numbered (e.g., “Chassis 1 of 3”) on a label located on the left side near the power receptacle.

Signals may only be routed from the inputs on a board to the outputs on the same board because each board has its own switching matrix.

To connect video inputs and outputs:

1. Fasten the cables onto the input and output BNC connectors (FIG. 20).

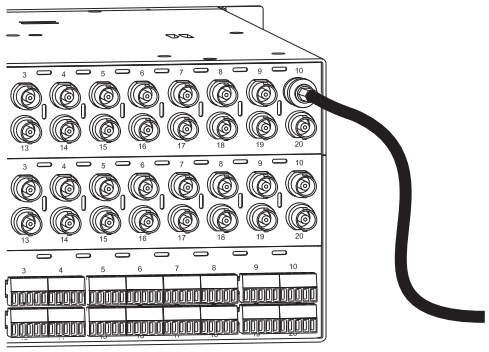


FIG. 20 Fasten cables onto input or output BNC connectors

Make sure the video cable is connected to the correct BNC connector on the correct enclosure. Standard video boards look similar to wideband (300 MHz) video and Hi-Z sync boards, but the “AutoPatch Connector Guide” identifies them.

S-Video I/O Boards

Applicability Notice

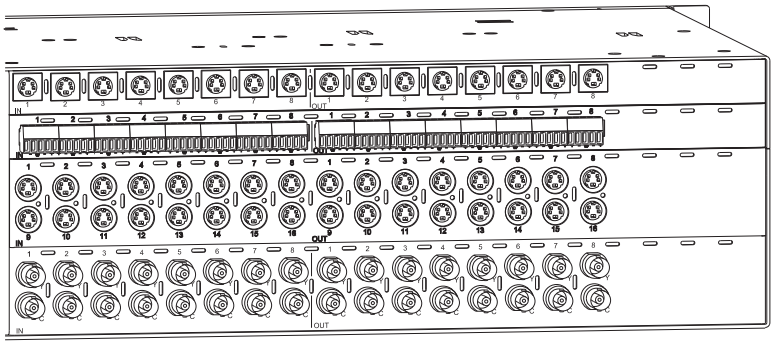


FIG. 21 Optima S-Video I/O boards (shown with a stereo audio board and a Y/c board)

This chapter pertains to the Optima S-Video input/output boards in the table below. These two boards come in a number of pre-engineered systems or can be ordered individually for custom systems.

S-Video I/O Boards	
Configuration	**Board Part #**
8x8	FG1046-446
16x16	FG1046-488

S-Video I/O Boards Specifications

Applies to S-Video I/O boards FG1046-446 and FG1046-488.

Specifications		
Parameter	**Conditions**	**Value**
Frequency Response	1 to All	±3 dB to 50 MHz ±1 dB to 15 MHz
Crosstalk	f = 5 MHz	<-60 dB
Signal to Noise Ratio (SNR)	Vin = 0.7 V, 100 IRE	>65 dB
Input level (max.)		±2.5 V
Input Impedance		75 ohms
Output level (max.)		±2.5 V
Output impedance		75 ohms
Connector Type		S-Video (4 Pin Mini-DIN) /Locking S-Video

AMX reserves the right to modify its products and their specifications without notice.

Attaching Cables

When attaching S-Video input and output cables, refer to the sheet labeled “AutoPatch Connector Guide” that ships with the system. The sheet shows where to attach each cable on the rear of each enclosure. Follow the sheet exactly; the system was programmed at the factory to operate *only* as indicated on the sheet. For multiple-enclosure systems, each enclosure will be numbered (e.g., “Chassis 1 of 3”) on a label located on the left side near the power receptacle.

Optima S-Video boards are equipped with locking S-Video connectors. When used in conjunction with an AMX AutoPatch manufactured S-Video cable, the connector and the cable lock into place. Standard S-Video connectors may be used, but will not lock.

Signals may only be routed from the inputs on a board to the outputs on the same board because each board has its own switching matrix.

To connect S-Video inputs and outputs:

1. Fasten the cables onto the input or output S-Video connectors (FIG. 22).

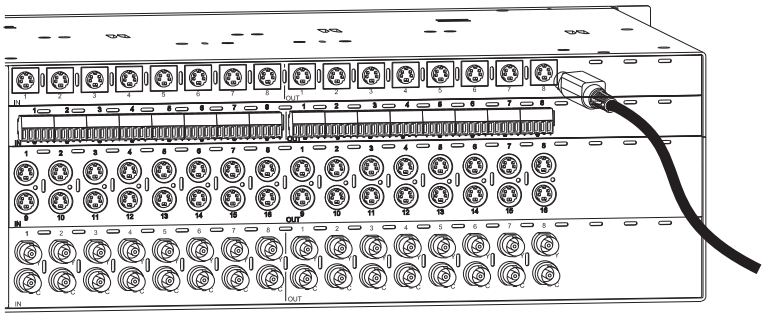


FIG. 22 Fasten the cable onto the connector

Caution: *To avoid damaging a locking S-Video connector or board, be sure to pull on the connector housing instead of the cable.*

To fasten a locking S-Video connector:

1. Hold the connector at a slight angle to the right while pushing in.
   Or
   Pull back on the housing of the connector (FIG. 23) while pushing the connector in.

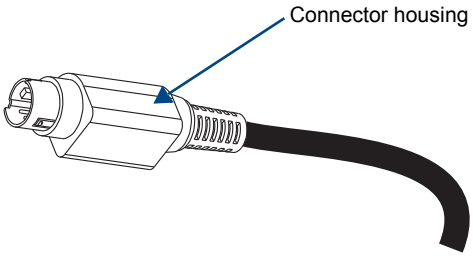


FIG. 23 Pull back housing to fasten the connector

To remove a locking S-Video connector:

1. Pull back on the housing of the connector, and pull the connector out.

Y/c I/O Board

Applicability Notice

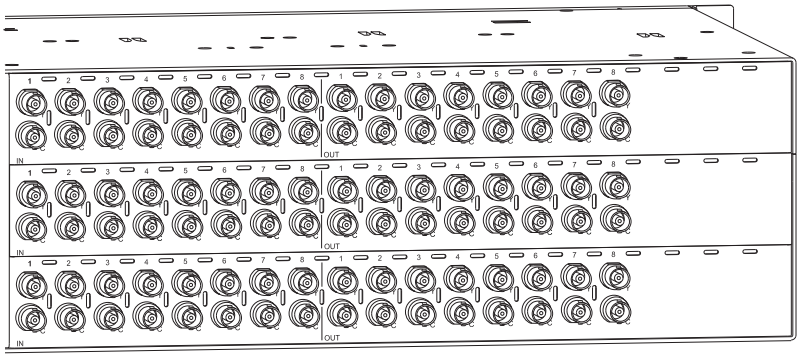


FIG. 24 Optima Y/c I/O boards

This chapter pertains to Optima Y/c input/output board, FG1046-476 (8x8), contained in pre-engineered systems and custom systems.

Y/c I/O Board Specifications

Applies to I/O board FG1046-476.

This board comes in a number of pre-engineered systems or can be ordered individually for custom systems.

Specifications		
Parameter	**Conditions**	**Value**
Frequency Response	1 to All	±3 dB to 50 MHz ±1 dB to 15 MHz
Differential Gain*	f = 3.58 MHz	<0.2% or better
Differential Phase*	f = 3.58 MHz	<0.2° or better
Input Impedance		75 ohms
Output Impedance		75 ohms
Connector Type		BNC

* Differential gain and phase measurements are performed with a standard 5-step modulated staircase test signal.

AMX reserves the right to modify its products and their specifications without notice.

Attaching Cables

When attaching Y/c input and output cables, refer to the sheet labeled “AutoPatch Connector Guide” that ships with the system. The sheet shows where to attach each cable on the rear of each enclosure. Follow the sheet exactly; the system was programmed at the factory to operate *only* as indicated on the sheet. For multiple-enclosure systems, each enclosure will be numbered (e.g., “Chassis 1 of 3”) on a label located on the left side near the power receptacle.

Signals may only be routed from the inputs on a board to the outputs on the same board because each board has its own switching matrix.

To connect Y/c inputs and outputs:

1. Fasten the cable pairs onto the input or output BNC connectors (FIG. 25).

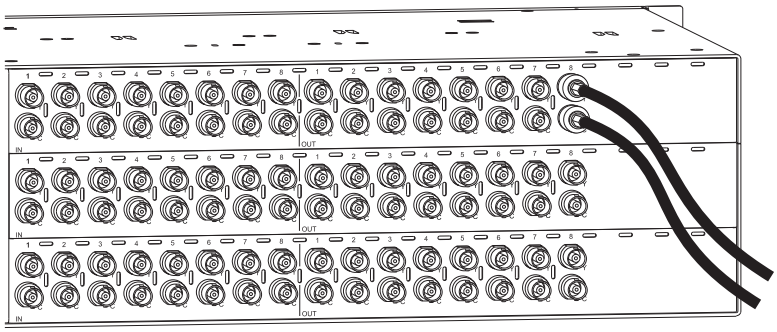


FIG. 25 Fasten the cables onto the “Y” and “C” connectors

Make sure the video cable is connected to the correct BNC connector on the correct enclosure. Y/c I/O boards look similar to standard and wideband (300 MHz) video boards, but the “AutoPatch Connector Guide” identifies them.

Wideband Video (300 MHz) I/O Boards

Applicability Notice

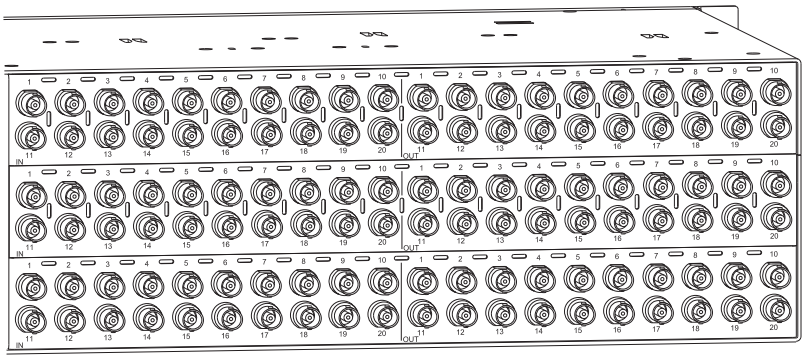


FIG. 26 Wideband video I/O boards

This chapter pertains to Optima wideband video (300 MHz) input/output boards contained in pre-engineered systems and custom systems. The table below provides information on the types of wideband video boards and their numbers.

Optima systems (pre-engineered and custom) with wideband boards generally contain multiples of the boards listed below for routing the separate components of a component video signal, e.g., routing the R, G, and B in an RGBHV signal. (Hi-Z sync boards or HV Hi-Z sync boards can be used in a wideband system to route horizontal and vertical sync signals.)

Wideband Video (300 MHz) I/0 Boards	
Note: *Specifications for the following boards are listed on page 48.*	
Configuration	**Board Part #**
8x8	FG1046-437
16x16	FG1046-482
16x24	FG1046-542
20x4	FG1046-467
20x20	FG1046-410
24x4	FG1046-503
24x16	FG1046-428
36x4	FG1046-419

Wideband Video (300 MHz) I/O Boards Specifications

Applies to I/O boards FG1046-410, FG1046-419, FG1046-428, FG1046-437, FG1046-467, FG1046-482, FG1046-503, and FG1046-542.

These boards come in a number of pre-engineered systems or can be ordered individually for custom systems.

Specifications		
Parameter	**Conditions**	**Value**
Frequency Response	1 to All	± 3.0 dB to 300 MHz or better ± 1.5 dB to 100 MHz or better
Frequency Response, FG1046-410 only	1 to All	± 3.0 dB to 300 MHz or better ± 2.0 dB to 100 MHz or better ± 1.5 dB to 50 MHz or better
Crosstalk	f = 5 MHz f = 30 MHz f = 150 MHz	<-60 dB <-40 dB <-35 dB
Signal to Noise Ratio (SNR)	Vin = 0.7 V, 100 IRE	>65 dB
Return Loss	f = 5 MHz	<-40 dB
Input Level (max.)		± 1.5 V
Input Level (max.), FG1046-410 only		± 1.2 V
Input Impedance		75 ohms
Output Level (max.)		± 1.5 V
Output Level (max.), FG1046-410 only		± 1.2 V
Output Impedance		75 ohms
Connector Type		BNC

AMX reserves the right to modify its products and their specifications without notice.

Attaching Cables

When attaching wideband video input and output cables, refer to the sheet labeled “AutoPatch Connector Guide” that ships with the system. The sheet shows where to attach each cable on the rear of each enclosure. Follow the sheet exactly; the system was programmed at the factory to operate *only* as indicated on the sheet. For multiple-enclosure systems, each enclosure will be numbered (e.g., “Chassis 1 of 3”) on a label located on the left side near the power receptacle.

Signals may only be routed from the inputs on a board to the outputs on the same board because each board has its own switching matrix.

The example in FIG. 27 shows a BNC cable attached to Output 9 on each board to route the R, Gs, and B components of an RGsB signal.

To connect video inputs and outputs:

1. Fasten the cables onto the input and output BNC connectors (FIG. 27).

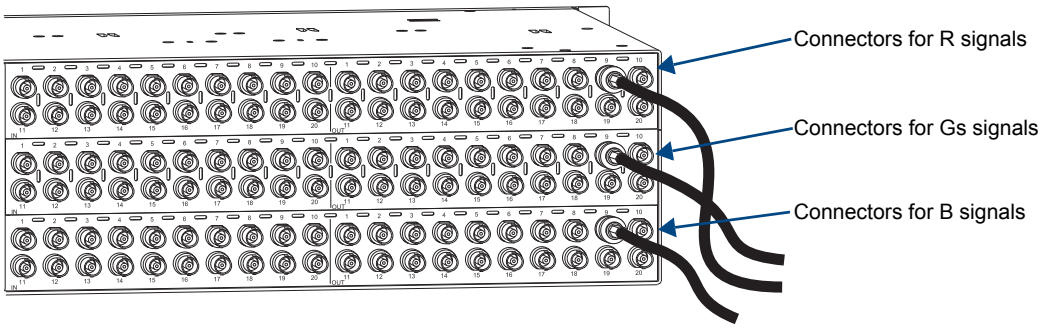
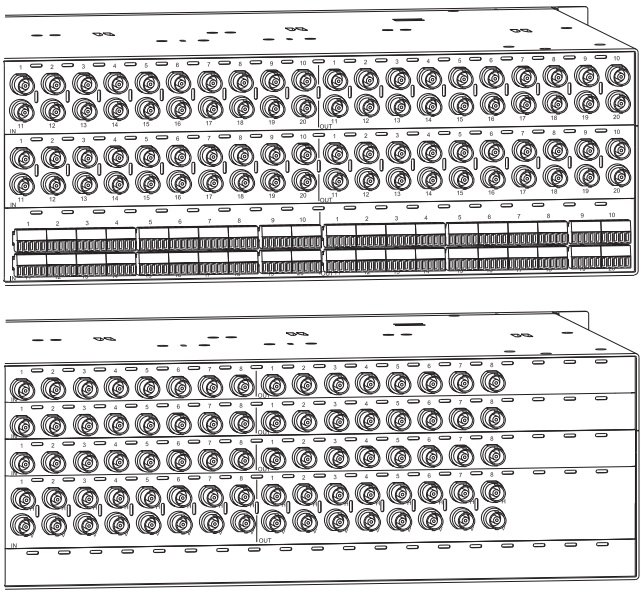


FIG. 27 Fasten cable onto the input or output BNC connector

Make sure the wideband video cable is connected to the correct BNC connector on the correct enclosure. wideband video boards look similar to standard video, Hi-Z sync, and HV Hi-Z sync boards, but the “AutoPatch Connector Guide” identifies them.

Hi-Z Sync and HV Hi-Z Sync I/O Boards

Applicability Notice



HI-Z sync boards
(shown with audio board)

HV Hi-Z HV sync board
(shown with wideband video boards)

FIG. 28 Hi-Z sync and HV Hi-Z sync boards

This chapter pertains to Optima Hi-Z and HV Hi-Z sync input/output boards contained in pre-engineered systems and custom systems. The table below provides information on the types of Hi-Z and HV Hi-Z sync boards and their numbers.

The 8x8 HV Hi-Z sync board (FG1046-443) routes both H and V signals. All larger configurations require two Hi-Z sync boards in an enclosure: one board for the H signal and one for the V signal.

Hi-Z Sync and HV Hi-Z Sync I/O Boards	
Note: *Specifications for these boards are listed on page 52.*	
Configuration	**Board Part #**
8x8 HV	FG1046-443
16x16	FG1046-569
16x24	FG1046-566
20x4	FG1046-563
20x20	FG1046-560
24x4	FG1046-557
24x16	FG1046-554
36x4	FG1046-551

Note: *Wideband (300 MHz) systems can use Hi-Z sync or HV Hi-Z sync boards to route horizontal and vertical sync signals.*

Hi-Z Sync and HV Hi-Z Sync I/O Boards Specifications

Applies to Hi-Z and HV Hi-Z sync I/O boards listed in the table on the previous page.

These boards come in a number of pre-engineered systems or can be ordered individually for custom systems.

Specifications		
Parameter	**Conditions**	**Value**
Input Level (max.)		0 to +5.5 V
Input Impedance		22 kohms
Output Level (max.)		0 to +5.5 V
Output Impedance		75 ohms
In/Out Polarity	Active high or low	Output polarity follows input polarity
Output Signal Level		Unity gain
Connector Type		BNC

AMX reserves the right to modify its products and their specifications without notice.

Attaching Cables

When attaching video input and output cables, refer to the sheet labeled “AutoPatch Connector Guide” that ships with the system. The sheet shows where to attach each cable on the rear of each enclosure. Follow the sheet exactly; the system was programmed at the factory to operate *only* as indicated on the sheet. For multiple-enclosure systems, each enclosure will be numbered (e.g., “Chassis 1 of 3”) on a label located on the left side near the power receptacle.

Signals may only be routed from the inputs on a board to the outputs on the same board because each board has its own switching matrix.

FIG. 29 has examples of cabling sync boards to route the H and V components of the HV sync signal. In the top example, BNC cables are attached to Output 10 on two Hi-Z sync boards. The bottom example shows BNC cables attached to the H and V connectors of Output 8 on a single 8x8 HV Hi-Z sync board.

To connect sync inputs and outputs:

1. Fasten the cables onto the input and output BNC connectors (FIG. 29).

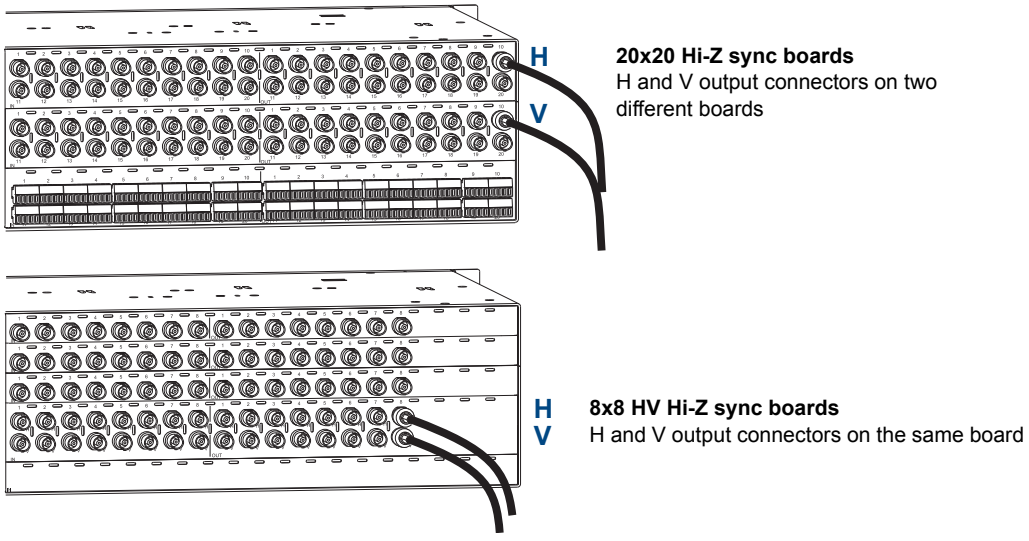


FIG. 29 Fasten cables onto input and output BNC connectors

Make sure the sync cable is connected to the correct BNC connector on the correct enclosure. Hi-Z sync and HV Hi-Z sync boards look similar to standard and wideband (300 MHz) video boards, but the “AutoPatch Connector Guide” identifies them.

RGBHV/HD-15 I/O Boards

Applicability Notice

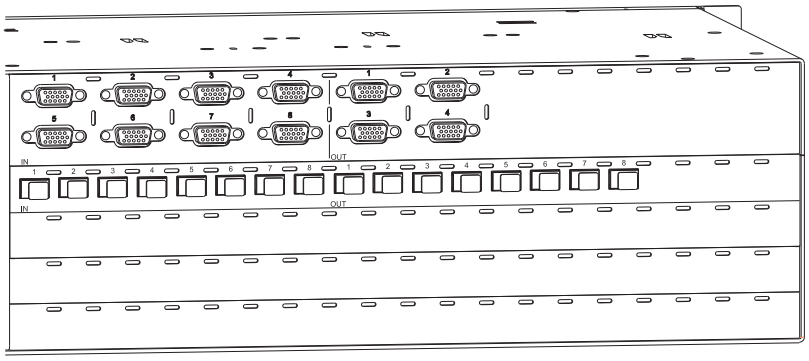


FIG. 30 8x4 RGBHV/HD-15 I/O board (shown with an 8x8 digital audio board)

This chapter pertains to Optima RGBHV/HD-15 input/output boards contained in pre-engineered systems and custom systems. The table below provides information on RGBHV/HD-15 boards and their numbers.

RGBHV/HD-15 I/O Boards	
Note: *Specifications for the following boards are listed on page 54.*	
Configuration	**Board Part #**
4x2	FG1046-530
8x4	FG1046-497
8x8	FG1046-536
15x15	FG1046-593

RGBHV/HD-15 I/O Boards Specifications

Applies to RGBHV/HD-15 I/O boards FG1046-497, FG1046-530, FG1046-536, and FG1046-593. These boards come in some pre-engineered systems or can be ordered individually for custom systems.

Specifications		
Parameter	**Conditions**	**Value**
Frequency Response	1 to All	±3.0 dB to 300 MHz or better ±1.5 dB to 100 MHz or better
Crosstalk	f = 5 MHz f = 30 MHz f = 150 MHz	<-60 dB <-40 dB <-35 dB
Signal to Noise Ratio (SNR)	Vin = 0.7 V, 100 IRE	>65 dB
Return Loss	f = 5 MHz	<-50 dB
Input Level max. (RGB)		±1.5 V
Input Impedance (RGB)		75 ohms
Input Level (HV)		+5.5 V
Input Impedance (HV)		22 kohms
Output Level max. (RGB)		±1.5 V
Output Impedance (RGB)		75 ohms
Output Level max. (HV)		+5.5 V
Output Impedance (HV)		75 ohms
HV Polarity	Active high or low	Output follows input polarity
Connector Type		HD-15

EDID Resolutions Supported through Local DDC*

Standard and established timings are provided in the tables below.

Standard Timings

Standard Timing Identification	Resolution	Refresh Rate Max.**
ID 1	1600x1200 (This is the preferred timing identified in the EDID.)	75 Hz
ID 2	640x480	120 Hz
ID 3	1024x768	120 Hz
ID 4	1280x1024	85 Hz
ID 5	800x600	120 Hz
ID 6	1152x864	120 Hz
ID 7	1600x1200	60 Hz
ID 8	1280x800	60 Hz

Established Timings

Resolutions	Refresh Rate Max.**
720x400	70 Hz, 88 Hz
640x480	60 Hz, 67 Hz, 72 Hz, 75 Hz
800x600	56 Hz, 60 Hz, 72 Hz, 75 Hz
832x624	75 Hz
1024x768	60 Hz, 70 Hz, 75 Hz, 87 Hz
1280x1024	75 Hz
1152x870	75 Hz

* Additional resolutions may be supported through local DDC.
** Some monitors may not support the maximum refresh rate.

AMX reserves the right to modify its products and their specifications without notice.

Attaching Cables

When attaching RGBHV/HD-15 input and output cables, refer to the sheet labeled “AutoPatch Connector Guide” that ships with the system. The sheet shows where to attach each cable on the rear of each enclosure. Follow the sheet exactly; the system was programmed at the factory to operate *only* as indicated on the sheet. For multiple-enclosure systems, each enclosure will be numbered (e.g., “Chassis 1 of 3”) on a label located on the left side near the power receptacle.

Signals may only be routed from the inputs on a board to the outputs on the same board because each board has its own switching matrix.

To connect HD-15 inputs and outputs:

1. Fasten the cables onto the input and output HD-15 connectors (FIG. 31).

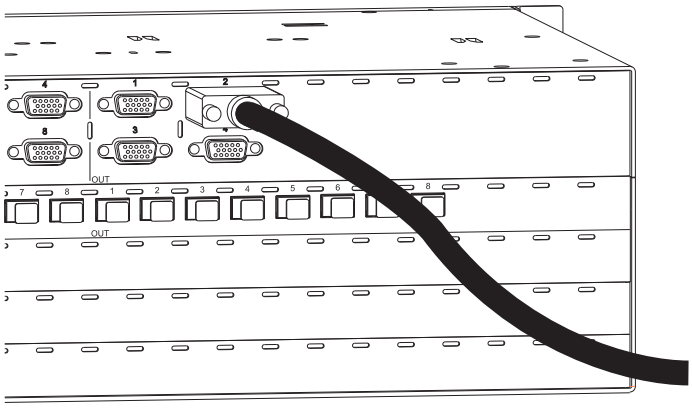
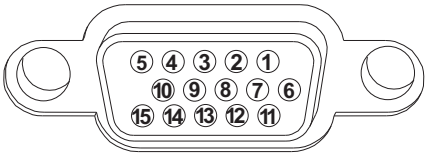


FIG. 31 Fasten cable onto input or output HD-15 connector

HD-15 Pinout

Pinout information for the High Density HD-15 connector on the RGBHV/HD-15 I/O board is provided below.



RGBHV/HD-15 Board Connector Pinouts		
Input (VESA DDC Compliant)		
1. Red	6. Red GND	11. ID Bit
2. Green	7. Green GND	12. DDC SDA
3. Blue	8. Blue GND	13. Horizontal sync
4. ID Bit	9. +5 VDC in DDC	14. Vertical sync
5. GND	10. GND	15. DDC SCL
Output		
1. Red	6. Red GND	11. ID Bit
2. Green	7. Green GND	12. ID Bit
3. Blue	8. Blue GND	13. Horizontal sync
4. ID Bit	9. +5 VDC out DDC	14. Vertical sync
5. GND	10. GND	15. ID Bit

Note: *55 mA supplied on output pin 9; power draw not to exceed 50 mA per port.*

FIG. 32 RGBHV/HD-15 board connector pinout

SD-SDI and HD-SDI Digital Video I/O Boards

Applicability Notice

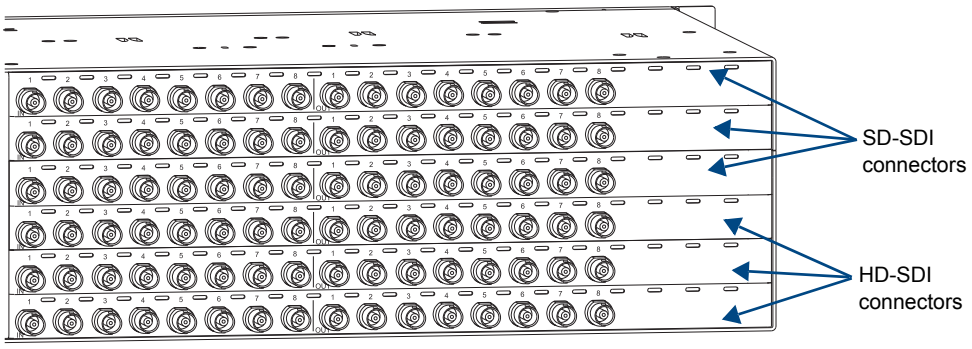


FIG. 33 SD-SDI and HD-SDI digital video I/O boards

This chapter pertains to Optima SD-SDI and HD-SDI digital video input/output boards contained in pre-engineered systems and custom systems. The table below provides information on the types of digital video boards and their numbers.

SD-SDI and HD-SDI I/O Boards	
Note: *Specifications for these boards are listed on page 58.*	
Configuration	**Board Part #**
SD-SDI 4x4	FG1046-527
SD-SDI 8x8	FG1046-491
HD-SDI 8x8	FG1046-590

Note: *HD-SDI digital video boards can also be used to route SD-SDI digital video signals.*

Dual Link HD-SDI

Two HD-SDI boards in the same enclosure can be used to route dual link HD-SDI* if they were ordered to do so and are wired in conjunction with each other. The configuration file is set up at the factory with a virtual matrix that routes the first input on the first board simultaneously with the first input on the second board, the second input with the second input, etc.

* Dual link HD-SDI consists of two HD-SDI signals that switch together in compliance with SMPTE 372M.

SD-SDI I/O Boards Specifications

Applies to I/O boards FG1046-491 and FG1046-527.

These boards come in a number of pre-engineered systems or can be ordered individually for custom systems.

Specifications	
Bit Rates	143 Mbps, 177 Mbps*, 270 Mbps, 360 Mbps, 540 Mbps*
Auto Data Rate Lock	Yes
Data Type	8 bit or 10 bit
Standard	Conforms to SMPTE 259M, SMPTE 344M
Input Level (max.)	0.8 Vpp, ±10%
Input Impedance	75 ohms
Auto Cable Equalization	Up to 1148 ft. (350 m) of Belden 8281 or equivalent typical @ 270 Mbps
Output Level (max.)	0.8 Vpp, ±10%
Output Impedance	75 ohms
Timing Jitter	<0.1 UI @ 360 Mbps
Alignment Jitter	<0.1 UI @ 360 Mbps
Rise and Fall Time	600 ps, ±100 ps (20% to 80%)
CDR (Reclocking)	Yes
Connector Type	BNC

* Untested for 177 Mbps and 540 Mbps bit rates.

HD-SDI I/O Boards Specifications

Applies to I/O board FG1046-590.

This board comes in a number of pre-engineered systems or can be ordered individually for custom systems.

Specifications	
Bit Rates	143 Mbps, 177 Mbps*, 270 Mbps, 360 Mbps, 540 Mbps*, 1.485 Gbps
Auto Data Rate Lock	Yes
Data Type	8 bit or 10 bit
Standard	Conforms to SMPTE 259M, SMPTE 292M, SMPTE 344M, SMPTE 372M**
Input Level (max.)	0.8 Vpp, ±10%
Input Impedance	75 ohms
Auto Cable Equalization	Up to 328 ft. (100 m) of Belden 8281 or equivalent typical @ 1.485 Gbps Up to 459 ft. (140 m) of Belden 1694A or equivalent typical @ 1.485 Gbps
Output Level (max.)	0.8 Vpp, ±10%
Output Impedance	75 ohms
Timing Jitter	<0.1 UI @ 1.485 Gbps
Alignment Jitter	<0.1 UI @ 1.485 Gbps
CDR (Reclocking)	Yes
Connector Type	BNC

* Data not available for 177 Mbps and 540 Mbps bit rates.

** Data not available for SMPTE 372M dual link format (using two I/O boards wired in conjunction for routing dual link HD-SDI signals).

AMX reserves the right to modify its products and their specifications without notice.

Attaching Cables

When attaching SD-SDI and HD-SDI input and output cables, refer to the sheet labeled “AutoPatch Connector Guide” that ships with the system. The sheet shows where to attach each cable on the rear of each enclosure. Follow the sheet exactly; the system was programmed at the factory to operate *only* as indicated on the sheet. For multiple-enclosure systems, each enclosure will be numbered (e.g., “Chassis 1 of 3”) on a label located on the left side near the power receptacle.

Signals may only be routed from the inputs on a board to the outputs on the same board because each board has its own switching matrix.

To connect SD-SDI or HD-SDI digital video inputs and outputs:

1. Fasten the cables onto the input and output BNC connectors (FIG. 34).

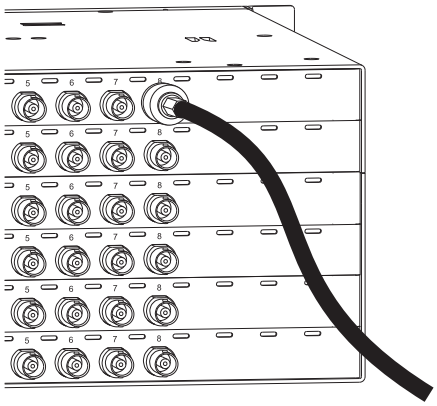


FIG. 34 Fasten cable onto the input or output BNC connector

Terminating Connectors

For optimal performance, attach 75-ohm terminating connectors to all unused outputs on SD-SDI and HD-SDI boards (FIG. 35).

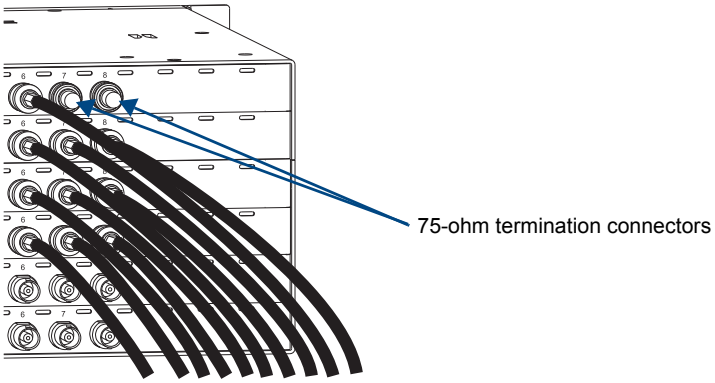


FIG. 35 Add 75-ohm termination connectors to unused outputs

Make sure the SD-SDI or HD-SDI digital video cable is connected to the correct BNC connector on the correct enclosure. Digital video boards look identical to each other and to standard and wideband (300 MHz) video and HV sync boards, but the “AutoPatch Connector Guide” identifies them.

DVI (Digital Visual Interface) I/O Boards

Applicability Notice

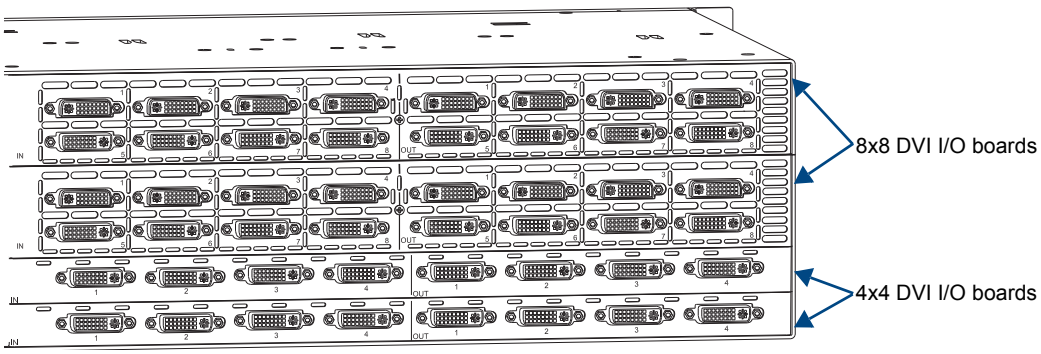


FIG. 36 Optima 8x8 and 4x4 DVI input/output boards

This chapter pertains to Optima DVI input/output boards contained in pre-engineered systems and custom systems. The table below provides information on the types of DVI boards and their numbers.

DVI I/O Boards	
Configuration	**Board Part #**
Note: *Specifications for the 4x4 board are listed on page 62.*	
4x4	FG1046-479
Note: *Specifications for the 8x8 board are listed on page 64.*	
8x8	FG1046-659

Overview

The Optima 4x4 and 8x8 DVI input /output boards support digital, single link (DVI-D) signals. The connectors on the DVI input and output boards allow for the use of cables from source and destination devices with either DVI-D or DVI-I connectors (for DVI-I, the analog pins are not used; see the DVI-I connector pinout information on page 66).

Both DVI boards also have local DDC (Display Data Channel) support with plug-and-play information provided by the Optima Distribution Matrix.

Special information applicable to the 8x8 board including software requirements and high-amperage outputs starts on page 67.

The DVI boards are pre-loaded with the most common EDID settings to ensure proper functionality with source devices. EDID Programmer software is provided on the *AMX AutoPatch CD* or at **www.amx.com** (search for EDID Library) for use with the 8x8 boards to assist with in-field programming, if necessary (see page 155).

The 4x4 DVI board does not currently support the EDID Programmer.

4x4 DVI I/O Board Specifications

Applies to I/O board FG1046-479.

This board comes in a number of pre-engineered systems or can be ordered individually for custom systems.

Specifications	
Parameter	**Value**
Data Rate (max.)	4.95 Gbps
Pixel Clock (max.)	165 MHz
Resolution Support	Up to 1600x1200 @ 60 Hz refresh rate
Signal Type	DVI-D (Single Link)
DDC/EDID Support	EDID provided by the Optima
HDCP Support	No
Input Voltage (nominal)	1.0 Vpp Differential
Input Voltage (max.)	1.5 Vpp Differential
Output Voltage (nominal)	1.0 Vpp Differential
Output Reclocking (CDR)	Yes
Output Pre-emphasis	Yes, for improved cable drive
Output +5 VDC DDC Pin	50 mA available on each output
Output Rise Time / Fall Time	75 ps min. to 240 ps max. (20% to 80%) 0.12 UI min. to 0.4 UI max. (@ 1.65 Gbps, 20% to 80%)
Connectors	DVI-I female (DVI-D single-link is the supported signal type)

Note: *Power requirements for the 4x4 DVI I/O board allow for no more than 4 boards in a single enclosure.*

EDID Resolutions Supported through Local DDC* for 4x4 DVI Board

Standard and established timings are provided in the tables below.

Standard Timings

Standard Timing Identification	Resolution	Refresh Rate Max.**
ID 1	1600x1200 (This is the preferred timing identified in the EDID.)	75 Hz
ID 2	640x480	120 Hz
ID 3	1024x768	120 Hz
ID 4	1280x1024	85 Hz
ID 5	800x600	120 Hz
ID 6	1152x864	120 Hz
ID 7	1600x1200	60 Hz
ID 8	1280x800	60 Hz

* Additional resolutions may be supported through local DDC.
** Some monitors may not support the maximum refresh rate.

Established Timings

Resolutions	Refresh Rate Max.**
720x400	70 Hz
720x400	88 Hz
640x480	60 Hz
640x480	67 Hz
640x480	72 Hz
640x480	75 Hz
800x600	56 Hz
800x600	60 Hz
800x600	72 Hz
800x600	75 Hz
832x624	75 Hz
1024x768	60 Hz
1024x768	70 Hz
1024x768	75 Hz
1024x768	87 Hz
1280x1024	75 Hz
1152x870	75 Hz

* Additional resolutions may be supported through local DDC.
** Some monitors may not support the maximum refresh rate.

8x8 DVI I/O Board Specifications

Applies to I/O board FG1046-659.

This board comes in a number of pre-engineered systems or can be ordered individually for custom systems.

Specifications	
Parameter	**Value**
Data Rate (max.)	4.95 Gbps
Pixel Clock (max.)	165 MHz
Resolution Support	Up to 1920x1200 @ 60 Hz refresh rate
Signal Type	DVI-D (Single Link)
DDC/EDID Support	EDID provided by the Optima EDID is user programmable
HDCP Support	No
Input Voltage (nominal)	1.0 Vpp Differential
Input Voltage (max.)	1.5 Vpp Differential
Input Equalization	Up to 40 dB Automatic
Input Cable Length (max.)	Up to 100 ft. (30.48 m), 1920x1200 @ 60 Hz* over high quality DVI 24 AWG, shielded-twisted pair cable
Input Cable Length (typical)	Up to 50 ft. (15.24 m), 1920x1200 @ 60 Hz over high quality DVI cable
Input Return Loss	<-40 dB (f = 825 MHz)
Output Voltage (nominal)	1.0 Vpp Differential
Output Reclocking (CDR)	Yes
Output Pre-emphasis	Yes, for improved cable drive
Output +5 VDC DDC Pin	1 A shared total available on Outputs 1 through 4 270 mA shared total available on Outputs 5 through 8
Output Rise and Fall Time	80 ps min. to 200 ps max. (20% to 80%) 0.13 UI min. to 0.33 UI max. (@ 1.65 Gbps, 20% to 80%)
Connectors	DVI-I female (DVI-D single-link is the supported signal type)

* Requires a source signal amplitude of 1 Vpp driving the cable.

EDID Resolutions Supported through Local DDC* for 8x8 DVI Board

Standard and established timings are provided in the tables below.

Standard Timings

Standard Timing Identification	Resolutions	Refresh Rate Max.**
ID 1	1920x1200 (This is the preferred timing identified in the EDID.)	60 Hz
ID 2	1920x1080	60 Hz
ID 3	1680x1050	60 Hz
ID 4	1600x1200	60 Hz
ID 5	1280x800	60 Hz
ID 6	1280x720	60 Hz
ID 7	1280x1024	60 Hz
ID 8	640x480	120 Hz

* Additional resolutions may be supported through local DDC.

** Some monitors may not support the maximum refresh rate.

Established Timings

Resolutions	Refresh Rate Max.**
720x400	70 Hz
720x400	88 Hz
640x480	60 Hz
640x480	67 Hz
640x480	72 Hz
640x480	75 Hz
800x600	56 Hz
800x600	60 Hz
800x600	72 Hz
800x600	75 Hz
832x624	75 Hz
1024x768	60 Hz
1024x768	70 Hz
1024x768	75 Hz
1024x768	87 Hz
1280x1024	75 Hz
1152x870	75 Hz

* Additional resolutions may be supported through local DDC.
** Some monitors may not support the maximum refresh rate.

AMX reserves the right to modify its products and their specifications without notice.

Attaching Cables

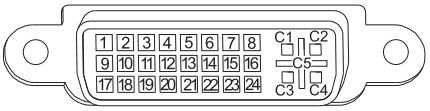
When attaching DVI input and output cables, refer to the sheet labeled “AutoPatch Connector Guide” that shipped with the system. The sheet shows where to attach each cable on the rear of each enclosure.

Tip: *For best results, use cable that meets or exceeds DVI compliant specifications.*

Follow the “AutoPatch Connector Guide” exactly; the system was programmed at the factory to operate *only* as indicated on the sheet. For multiple-enclosure systems, each enclosure will be numbered (e.g., “Chassis 1 of 3”) on a label located on the left side near the power receptacle.

Attaching DVI Cables

DVI-I Input & Output Connector Pinout



Input

1. Data 2-	9. Data 1-	17. Data 0-	C1. No connect
2. Data 2+	10. Data 1+	18. Data 0+	C2. No connect
3. Ground	11. Ground	19. Ground	C3. No connect
4. No connect	12. No connect	20. No connect	C4. No connect
5. No connect	13. No connect	21. No connect	C5. No connect
6. DDC-CLK	14. +5 VDC in	22. Ground	
7. DDC-Data	15. Ground	23. CLK+	
8. No connect	16. Hot-Detect	24. CLK-	

Output

1. Data 2-	9. Data 1-	17. Data 0-	C1. No connect
2. Data 2+	10. Data 1+	18. Data 0+	C2. No connect
3. Ground	11. Ground	19. Ground	C3. No connect
4. No connect	12. No connect	20. No connect	C4. No connect
5. No connect	13. No connect	21. No connect	C5. No connect
6. DDC-CLK	14. +5 VDC out*	22. Ground	
7. DDC-Data	15. Ground	23. CLK+	
8. No connect	16. Hot-Detect	24. CLK-	

FIG. 37 DVI-I connector pinout (4x4 and 8x8 boards)

* Output Pin 14 (+5 VDC out):

- On the 4x4 DVI Board, Output Pin 14 supplies 50 mA available on each output; power draw not to exceed 50 mA per port.
- On the 8x8 DVI Board, Output Pin 14 supplies 1 A shared total available on Output 1 through Output 4, and 270 mA shared total available on Output 5 through Output 8.

Signals may only be routed from the inputs on a board to the outputs on the same board because each board has its own switching matrix.

Note: *The top row of connectors on the 8x8 DVI board are upside-down relative to the bottom row.*

To connect DVI inputs and outputs:

1. Fasten the DVI-I (or DVI-D) connectors on the cable ends onto the DVI-I receptacles.

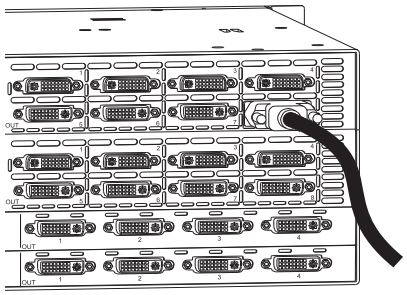


FIG. 38 Fasten cable onto the input or output DVI-I receptacle

2. For the 8x8 DVI board only – we recommend cycling power to check for possible in-rush over-current shut down during power up (see “High-Amperage DVI Outputs on the 8x8 DVI Board” section on page 67).

8x8 DVI Board: Special Information

Application Code for the 8x8 DVI Board

Important: *The Optima 8x8 DVI board requires Application Code v1.2.2 or later to work properly (to determine the version, see directions below). If the enclosure's Application Code version is not at least v1.2.2, contact technical support (see page 38) for instructions on upgrading the Application Code.*

To determine the enclosure's Application Code version:

1. *Before* applying power to the system, attach a PC to the Optima's Control port with a null modem serial cable (for full instructions, see page 29).
2. Open HyperTerminal (or other terminal emulation program) on the PC.
3. Apply power to the system.
4. Enter `~scrv1i1!` to access the splash screen that displays the hardware driver (appcode) version.
5. View the displayed splash screen for system information including the Application Code version (referred to as the "hardware driver").
   An example of an Optima splash screen is shown in FIG. 39.

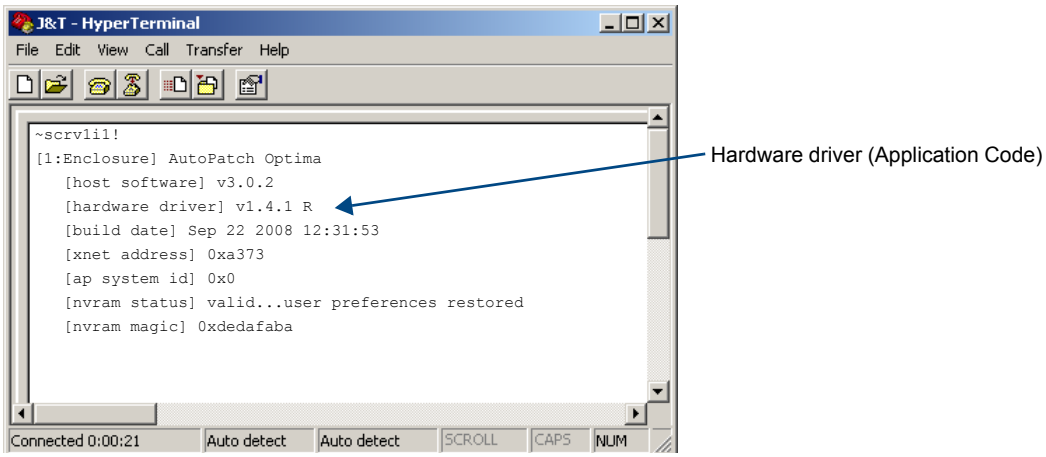


FIG. 39 Example of Optima splash screen

Note: *Your splash screen may differ. AMX reserves the right to change the contents and/or formatting of the splash screen without notice.*

High-Amperage DVI Outputs on the 8x8 DVI Board

The first set of four connectors (Outputs 1 through 4) on the 8x8 DVI board are high-amperage outputs, supplying 1 A of maximum cumulative power to destination devices across them. The second set of four connectors (Outputs 5 through 8) supply 270 mA of maximum cumulative power capability across them.

Important: *We recommend checking the documentation for the destination devices for information about specific power requirements.*

If the total power draw of all destination devices connected to either set of four connectors (see above) exceeds the DVI board's maximum over-current level for those connectors, that set of four connectors will go into a "protection" condition and shut down to avoid damage to the system. To avoid over-current shutdown, check the system (during initial installation) for destination devices that may exceed the DVI board's over-current level using the steps on the following page.

Checking for Potential Over-Current Shutdown (applies to initial setup of Optima system)

To check for potential over-current shutdown:

1. Follow the instructions for initial installation starting on page 19.
   For the 8x8 DVI board only, modify Step 4 on page 20 by following Steps 2 through 9 below.
2. Attach the first destination device to Output 1.
3. Cycle power to the Optima and the first destination device.
4. Note the device attached to Output 1 to see if it still has power (visually check for display).
   If the device does not have power, go to Step 8 below.
   If the device has power, attach the second destination device to Output 2.
5. Cycle power to the Optima and the two destination devices.
6. Note the destination devices to see if they still have power (visually check for display).
7. Repeat Steps 2 through 6 with the third destination device being attached to Output 3, and so on for the remaining devices and connectors.
8. If a set of four connectors shuts down (destination devices lose power) after attaching a device, replace or eliminate that device.

Tip: *If the device is attached to one of the second set of outputs (5 through 8), it may resolve the problem to attach the device to one of the first set of outputs (1 through 4), which have a higher output power rating.*

9. After all the destination devices are connected, cycle power to the Optima and all the destination devices.

Troubleshooting When Protection Condition Occurs During Operation

When a protection condition occurs, first, check each destination device separately for any obvious malfunction. If there is no obvious problem with any of the devices, see the following information and troubleshooting procedure.

In this following example, an Optima system is set up and running with all DVI outputs connected to destination devices. An unexpected occurrence causes Destination 3 to draw more power than the board supports and results in a protection condition (Destinations 1 through 4 do not receive power).

To determine which device triggered the protection condition:

1. Detach destination devices 1 through 4 from the connectors (do *not* cycle power to any equipment).
2. Attach Device 1 to Output 1 (normal operation)
   Attach Device 2 to Output 2 (normal operation)
   Attach Device 3 to Output 3 (protection condition – none of the three devices have power).
3. Detach all three devices.
4. Reattach Devices 1 and 2 (normal operation) and attach Device 4 (normal operation).
5. Replace or eliminate Device 3.

The protection condition responds to a cumulative power draw. For example, the protection condition may occur after Device 4 is attached because its current draw puts the cumulative power draw over the board's limit, not because Device 4 itself is defective. It may be necessary to experiment with the order of reattaching devices. One method to help isolate the defective device is to attach the devices in reverse order.

HDMI I/O Board

Applicability Notice

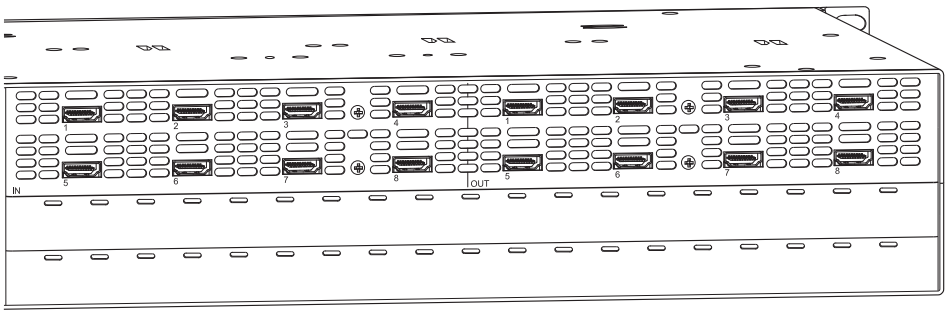


FIG. 40 HDMI I/O board in pre-engineered system AVS-OP-0808-JD0

This board chapter pertains to the Optima HDMI I/O (Input/Output) board in pre-engineered system AVS-OP-0808-JD0. The board can also be ordered as part of a custom system.

8x8 HDMI Pre-engineered System		
Note: *Specifications for the 8x8 HDMI board in this system are on page 70 through page 78.*		
Configuration	**System Sales #**	**System Part #**
8x8	AVS-OP-0808-JD0	FGP46-0808-JD0

HDMI I/O Board		
Note: *Specifications for the following board are on page 70 through page 78.*		
Configuration	**Boards Sales #**	**Board Part #**
8x8	AVS-OP-0808-HDMI-2S	FG1046-614

The HDMI I/O board is designed to route high-resolution HDMI or DVI signals with or without HDCP (High-bandwidth Digital Content Protection). DVI signals must be, single-link DVI signals and are connected only with the use of a cable adapter. Destination devices with either DVI-I or single-link DVI-D connectors are supported.

The HDMI I/O board is HDMI 1.3a compatible and HDCP 1.3 compatible. The board features AMX HDCP InstaGate® technology* for low-latency switching of HDCP protected content and supports computer video up to 1900x1200 and HDTV up to 1080p. The connectors also support embedded audio both linear PCM (stereo audio) and non-linear PCM (Dolby 5.1 and DTS 5.1).

The boards are pre-loaded with the most common EDID settings to ensure proper functionality with source devices. The EDID Programmer (see page 155) allows specific display EDID settings to be custom loaded on each input if desired and is available on the *AMX AutoPatch CD* and at **www.amx.com** (search for EDID Library).

Signals may only be routed from the inputs on a board to the outputs on the same board because each board has its own switching matrix.

* InstaGate® technology significantly reduces the HDCP latency and interruptions on all displays in a system. HDCP latency and interruptions are typically experienced when High-Bandwidth Digital Content Protection (HDCP) authenticates HDMI or DVI source and destination devices. InstaGate® technology effectively “opens the gate” by pre-authorizing connected source and destination devices to satisfy HDCP authentication.

HDMI I/O Board Specifications

Applies to the HDMI I/O board in system FGP46-0808-JD0 and to HDMI I/O board FG1046-614.

Specifications	
Compatible Formats	HDMI 1.3a (HDCP 1.3), DVI 1.0
Data Rate (max.)	4.95 Gbps
Pixel Clock (max.)	165 MHz
Progressive Resolution Support	480p up to 1920x1200 @ 60 Hz (1600x1200 @ 60 Hz and higher requires reduced blanking)
Interlaced Resolution Support	480i, 576i, 1080i
Audio Format Support	Dolby Digital,* DTS,* L-PCM
Audio Resolution	16 bit to 24 bit
Audio Sample Rate	32 kHz, 44.1 kHz, 48 kHz, 96 kHz,** 192 kHz**
Signal Type Support	HDMI DVI-D (single link with cable adapter)
DDC/EDID Support	EDID provided by the Optima EDID is user re-programmable
HDCP Support	Yes, full matrix HDCP support (includes any input to any or all outputs) AMX HDCP InstaGate® Technology
Input Voltage (nominal)	1.0 Vpp differential
Output Voltage (nominal)	1.0 Vpp differential
Output Re-clocking (CDR)	Yes
Output +5 V DDC pin	50 mA max. per output port
Output Rise Time / Fall Time	75 ps min. to 144 ps max. (20% to 80%) 0.12 UI min. to 0.24 UI, max. (@ 1.65 Gbps, 20% to 80%)
Connectors	HDMI Type A female

* Dolby Digital and DTS support up to 48 kHz, 5.1 channels.

** Two channel L-PCM support up to 192 kHz at 1080p (50 Hz, 59 Hz, 60 Hz).
Two channel L-PCM support up to 96 kHz at 720p, (50 Hz, 59 Hz, 60 Hz), 1080p (24 Hz, 25 Hz, 30 Hz, 50 Hz, 59 Hz, 60 Hz), 1080i (50, 59, 60 fields).
Two channel L-PCM support up to 48 kHz at all resolutions.

Important: *Before purchasing an 8x8 HDMI board as an upgrade for an Optima 2 RU or 3 RU enclosure in the field, be sure to check with an AMX Sales Representative regarding hardware and firmware compatibility.*

AMX reserves the right to modify its products and their specifications without notice.

EDID Resolutions Supported through Local DDC for 8x8 HDMI Board

Standard and established timings are provided in the tables following along with detailed timing blocks.

Important: *The EDID can be re-programmed to support additional resolutions through the local DDC using the EDID Programmer (see page 155). If you are experiencing video or audio problems, be sure to verify that the destination device does not support Dolby or DTS or high PCM frequency rates before reprogramming the EDID.*

Standard Timings

Standard Timing Identification	Resolution	Refresh Rate Max.
ID 1	1920x1080 (This is the preferred timing identified in the EDID.)	60 Hz
ID 2	1680x1050	60 Hz
ID 3	1600x1200	60 Hz
ID 4	1280x800	60 Hz
ID 5	1280x720	60 Hz
ID 6	1280x1024	60 Hz
ID 7	1360x765	60 Hz
ID 8	1440x900	60 Hz
ID 9	2048x1152	60 Hz
ID 10	1600x900	60 Hz
ID 11	1400x1050	60 Hz
ID 12	1280x960	60 Hz

Established Timings

Resolution	Refresh Rate
640x480	60 Hz, 67 Hz, 72 Hz, 75 Hz
800x600	56 HZ, 60 Hz, 72 Hz, 75 Hz
832x624	75 Hz
1024x768	60 Hz, 70 Hz, 75 Hz, 87 Hz
1280x1024	75 Hz
1152x870	75 Hz

Detailed Timing Blocks

Resolution	Refresh Rate
1920x1080	60 Hz, 148.5 MHz
1920x1080	60 Hz, 138.5 MHz
1920x1080	60 Hz, 141.5 MHz
1920x1200	60 Hz, 158.25 MHz
1920x1200	60 Hz, 154.0 MHz

CEA Video Information Code (VIC) Formats

VIC #	Resolution	Refresh Rate and Aspect Ratio
VIC = 1	640x480p	59.94/60 Hz 4:3
VIC = 2	720x480p	59.94/60 Hz 4:3
VIC = 3	720x480p	59.94/60 Hz 16:9
VIC = 4	1280x720p	59.94/60 Hz 16:9
VIC = 5	1920x1080i	59.94/60 Hz 16:9
VIC = 6	720(1440)x480i	59.94/60 Hz 4:3
VIC = 7	720(1440)x480i	59.94/60 Hz 16:9
VIC = 14	1440x480p	59.94/60 Hz 4:3
VIC = 15	1440x480p	59.94/60 Hz 16:9
VIC = 16	Native 1920x1080p	59.94/60 Hz 16:9
VIC = 17	720x576p	50 Hz 4:3
VIC = 18	720x576p	50 Hz 16:9
VIC = 19	1280x720p	50 Hz 16:9
VIC = 20	1920x1080i	50 Hz 16:9
VIC = 21	720(1440)x576i	50 Hz 4:3
VIC = 22	720(1440)x576i	50 Hz 16:9
VIC = 29	1440x576p	50 Hz 4:3
VIC = 30	1440x576p	50 Hz 16:9
VIC = 31	1920x1080p	50 Hz 16:9
VIC = 32	1920x1080p	23.97/24 Hz 16:9
VIC = 33	1920x1080p	25 Hz 16:9
VIC = 34	1920x1080p	29.97/30 Hz 16:9
VIC = 39	1920x1080i	50 Hz 16:9
VIC = 41	1280x720p	100 Hz 16:9
VIC = 42	720x576p	100 Hz 4:3
VIC = 43	720x576p	100 Hz 16:9
VIC = 44	720(1440)x576i	100 Hz 4:3
VIC = 45	720(1440)x576i	100 Hz 16:9
VIC = 47	1280x720p	119.88/120 Hz 16:9
VIC = 48	720x480p	119.88/120 Hz 4:3
VIC = 49	720x480p	119.88/120 Hz 16:9

Audio Data Block

Channels	Sampling Frequency
2 Channel L-PCM 32, 44.1, 48, 88.2, 96, 176.4	192 kHz sampling frequency at 16, 20, or 24 bits per sample
AC-3 (Dolby Digital) 6 Channels (5.1)	48 kHz sampling frequency
DTS 6 Channels (5.1)	48 kHz sampling frequency

Attaching Cables

When attaching HDMI cables, refer to the sheet labeled "AutoPatch Connector Guide" that shipped with the system. The sheet shows where to connect the cables on the rear of each enclosure. (Multiple-enclosure systems have an enclosure number sticker on the rear of each enclosure.) Follow the sheet exactly; the system was programmed at the factory to operate *only* as indicated on the sheet.

The input connectors are on the left side of each Optima board, and the output connectors are on the right. Input and output connectors are numbered separately. The HDMI I/O board has 8 input connectors and 8 output connector for an 8x8 configuration. Custom enclosures may contain other I/O boards for additional signal types.

To connect HDMI connectors:

1. Attach HDMI connectors to HDMI receptacles.

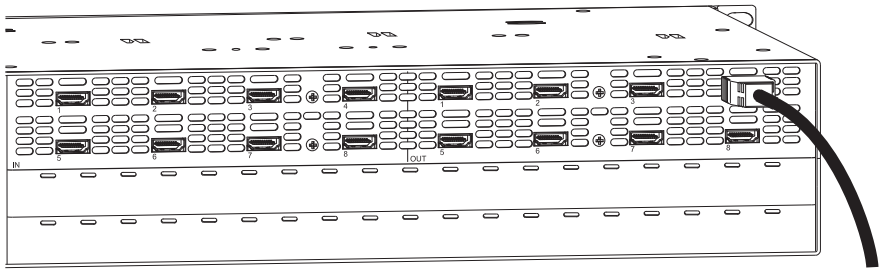


FIG. 41 Attach HDMI connectors to HDMI receptacles

Executing a Test Switch for an HDMI I/O Board

For HDMI boards, the system stores sink information when a switch is executed and retains that information even after the switch is disconnected. Therefore, we recommend becoming familiar with how HDMI switching works in an Optima by reading the rest of this chapter before executing a test switch. Then execute the test switch to verify the system is working correctly, disconnect the test switch, and clear the sink key cache (see page 83) before finishing the installation.

Overview – Optima Systems with HDMI

The Optima HDMI I/O board provides true matrix switching for complete distribution of high resolution digital video and embedded audio (cannot breakaway the audio) from 8 sources to any or all of 8 destinations. Full HDMI support allows 1080p protected entertainment content to be switched freely, while high resolution capabilities (1900x1200) provide the advantage of being able to use this solution to switch high resolution computer images or a combination of both.

The HDCP standard was established to prevent the unauthorized transfer of protected audiovisual content between devices.

The Optima HDMI I/O board routes HDCP (content-protected) and non-HDCP digital audiovisual signals. If HDCP is applied, the transmitted video is encrypted. The input connectors on the board act as HDCP receivers (RXs), and the output connectors on the board act as HDCP transmitters (TXs). If the content is protected (HDCP), the board acts as an HDCP repeater, allowing the source device to authenticate each destination device (and repeater) that it is routed to. Once the authentication is complete, the encrypted content begins to be displayed on the destinations.

Note: *The Optima HDMI input/output board does not support CEC.*

Optima HDMI System Conditions

- HDCP is used only when the source content is copyright protected. Unprotected content is not affected and may be routed as desired.
- If a source device enforces HDCP compliance, only those destination devices which are HDCP compliant (as judged so by the source device) will be capable of displaying the source's HDCP protected content.
- Each input on the Optima HDMI I/O board supports a maximum of 16 downstream devices, which are referred to as sinks (destination devices and repeaters).

Normally, all devices used in an HDMI system are HDCP compliant. Each HDCP capable device model has a unique set of confidential keys (used to encrypt and decrypt the data).

The content protection process for the point-to-point connection between the upstream transmitter on the source device and an Optima input connector (RX) and on through the Optima output connector (TX) to the destination device includes five steps.

Five Steps in Content Protection Process

1. The Optima uses an authentication protocol to verify that the display device is licensed to receive the content.
2. The transmitter on the source device uses authentication protocol to verify that the Optima input (RX) and any routed downstream sinks are licensed to receive the content.
3. The content is encrypted and transmitted.
4. The source device's transmitter periodically verifies that the Optima input is still synchronized and capable of decrypting the protected content.
5. The Optima periodically verifies that the display device(s) is still synced and capable of decrypting the protected content.

Note: *If the source does not support HDCP, the display device does not need to support HDCP. The unencrypted content from the source is simply routed through the output(s) to the display device(s).*

Unsuccessful Transmission in System

Note: *Be sure the destination devices support the resolution of the source device.*

If an Optima HDMI system does *not* successfully transmit the protected content to any of the routed sinks, it may indicate one of the following conditions:

- Invalid key – The Optima output connector detected an invalid authentication key on the destination device.
- Non-compliant device – The sink device is not HDCP compliant or has had its authentication key revoked.*
- Source sink support limit exceeded – The source device has been routed to more sinks (display devices and/or repeaters) than it can support.
- Optima HDMI input sink support limit exceeded – The input is actively routed to more than 16 downstream sinks (display devices and/or repeaters).

* Key revocation is handled strictly by the source device. The Optima does not take any action with respect to revoked keys.

Supported Number of Sinks

HDCP source devices and the Optima HDMI inputs each support a specific maximum number of sinks.

HDCP Source Device

Each source has a specific number of sinks (repeaters and/or destination devices) that it can support in addition to the first downstream repeater (which may or may not be an Optima). The number of sinks the source supports downstream of the first repeater is determined by the source's manufacturer.

Optima

Each Optima HDMI input supports a maximum of 16 downstream sinks (repeaters and/or destination devices). The Optima, which functions as a repeater, may or may not be the first repeater in the system.

Once a source is routed through the Optima to a sink, that sink's key is added to the Optima input's sink key cache (list of supported sinks) and remains in the cache even if the sink is disconnected.

One Sink Too Many

Tip: *We recommend keeping track of the number of sinks (repeaters and destinations) in a system to avoid the problem of having one too many.*

If you attempt to route the source to an additional sink past its limit or the Optima input's limit of 16 (whichever occurs first), the protected content will *not* be transmitted to any of the routed sinks.

Having one sink too many can occur in two different cases (the solution for each is also different).

- If a source supports less than 16 sinks downstream from the Optima and an additional sink past the source's limit is added anywhere in the system, the protected content stops transmitting. Removing a repeater between the source and the Optima will restore transmission of protected content. Disconnecting a sink downstream from the Optima, will *not* restore the transmission of protected content because the disconnected sink's key is still in the input's sink key cache. The cache needs to be cleared and the cleared state needs to be persisted (if the cache was previously persisted) so authentication can be completed again (for cache information, see page 82).
- If a source could support 16 or more sinks downstream from the Optima and a 17th sink is added downstream of the Optima, the protected content stops transmitting and the input on the HDMI board automatically clears its cache. The input will authenticate each of the downstream sinks again, but when it reaches the 17th sink, the protected content stops transmitting and the cache is cleared. This process will continue indefinitely until one of the Optima's downstream sinks has been unplugged, bringing the number back to 16 (the Optima's sink limit).

Four Examples of *HDCP Source Sink Support (FIG. 42 through FIG. 45):*

The next four figures illustrate system setups in which the source device supports a maximum of 3 sinks downstream of the first repeater (R1) with varying numbers of repeaters and destinations.

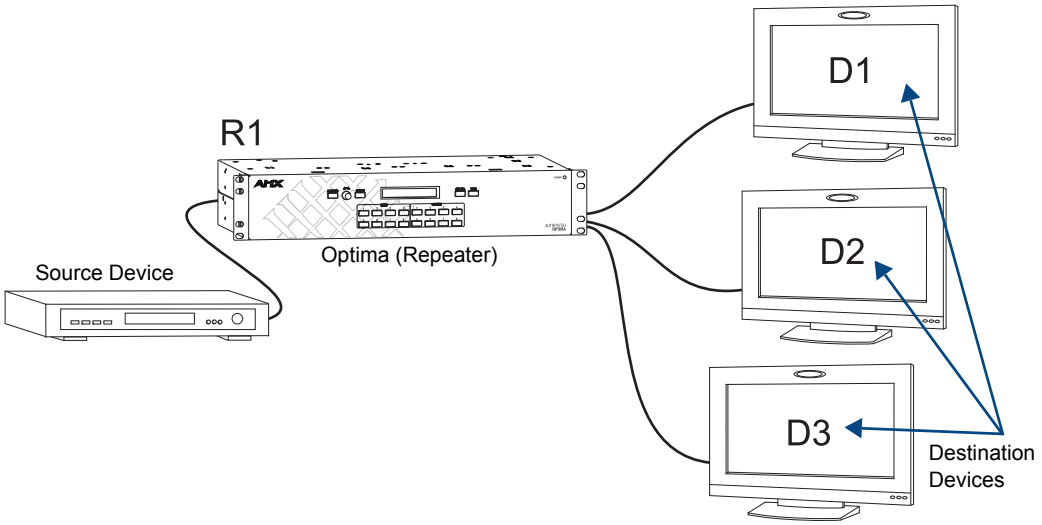


FIG. 42 Example #1 – Source device supports 3 sinks (three destination devices) downstream of R1

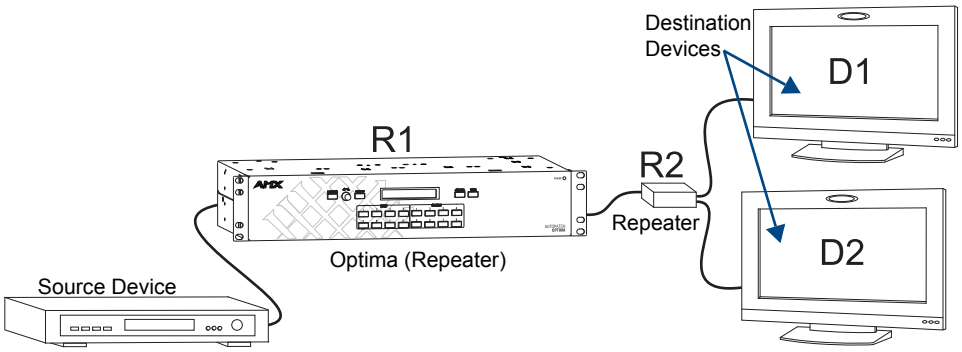


FIG. 43 Example #2 – Source device supports 3 sinks (R2 and two destination devices) downstream of R1

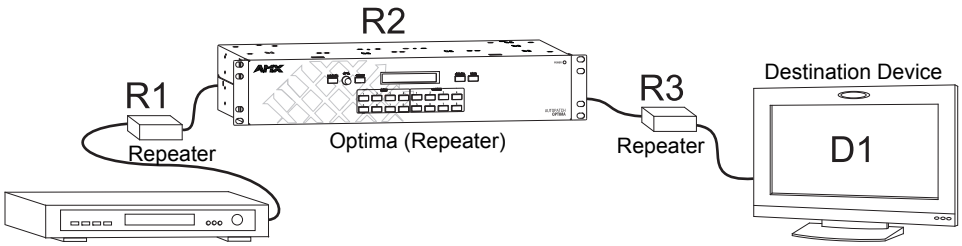


FIG. 44 Example #3 – Source device supports 3 sinks (R2, R3, and one destination device) downstream of R1

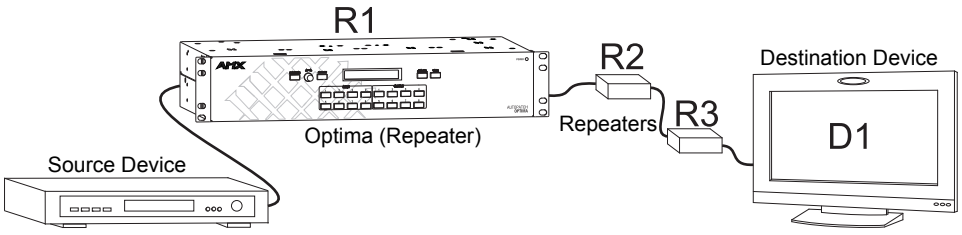


FIG. 45 Example #4 – Source device supports 3 sinks (R2, R3, and one destination device) downstream of R1

Determining Sink Support Maximum on a Source Device

Determining how many sinks the source can support is necessary to ensure the system runs smoothly.

Note: *If you already know how many sinks each source supports, go to "Initializing InstaGate® Technology" on page 81 to do an initial authentication of HDMI source and destination devices.*

This section is intended to help analyze the system based on the types of source devices used, so any limits imposed by the source devices within the matrix switching system can be addressed. For example, if a source that supports a very low number of sinks is switched to more sinks than that source can handle, the protected content will *not* be transmitted to any of the routed sinks.

The easiest way to determine the sink support maximum on a source device is to reference the information from the equipment manufacturer's product documentation. If documentation is not available, we recommend following the instructions below (an example is also provided on page 77).

Important: *During the procedure below, keep in mind that the "failure condition" (in which HDCP authentication fails to occur) varies by source device manufacturer and may manifest itself in one of several ways, e.g., snow, static, a solid color, no image at all, or a flashing image (where the image changes back and forth at a high speed from the correct image to a black screen).*

As soon as a source is switched to one more output than it can support, the protected content will *not* be transmitted to any of the routed sinks.

To determine sink support maximum up to 8 on a source device:

1. Connect the source device to an input on the Optima and connect destination devices to all 8 outputs.
2. Establish serial control between the Optima and the PC with a null modem serial cable via the Control port (see page 29).
3. Using your preferred method of control, send a command to make sure all outputs are disconnected from the input for the source device.
4. On the PC, open HyperTerminal (or other terminal emulation program) and enter `@et` to clear any keys for supported sinks that may be cached within the InstaGate® layer. Note that the response to the `@et` command is `@ev`.

Note: *During this process, the destination device must be connected directly to the output of the matrix switcher and not going through additional equipment (e.g., a repeater).*

5. Execute a switch to the first display device connected to the Optima (i.e., add a sink to the source). A delay in the display of the video image of approximately 3 to 10 seconds* can be expected due to the source engaging the display device for the first time initialization of HDCP authentication. (It is normal for the remaining monitors to lose and then regain content as each new output is added.)
6. Once a stable video image is seen at the destination device, continue routing the source to one additional output at a time (i.e., add each new sink to the source one at a time) until one of the following occurs (be sure to wait for the HDCP validation process and the resulting stable image to show each time before adding another output):
   - If the source fails to validate a destination device and the image is lost, the number of sinks the source supports is equal to the total number of sinks that properly displayed the image before all video was lost.
     To verify the failure is due to a source support limitation and not a revocation of the destination device's key, clear the cache on the board (see page 83), then route the source to the last destination device again, and verify stable video.
   - All 8 outputs are validated and show content, i.e., source's sink support maximum is 8 or more.

* Time for initial authentication can vary noticeably for different source and destination devices.

Example of Determining Sink Support (FIG. 46):

FIG. 46 illustrates a source device that was checked and found to support only 5 sinks past R1. The check included the following: From a clear matrix state (the cache is clear), the source device was routed to Outputs 1, 2, 3, 4, and 5 one at a time as a stable image appeared on each destination device. When attempting to route the source device to the sixth output, all displays lost content. Only five of the destination devices will be able to receive a signal from this source. At this point, the limitation of the source device was noted and the cache cleared (see page 82). The remaining sources were checked one at a time using the same method, and then the system was initialized using InstaGate® technology (see page 81) to route each source device to specific destination devices (up to the maximum each source supports).

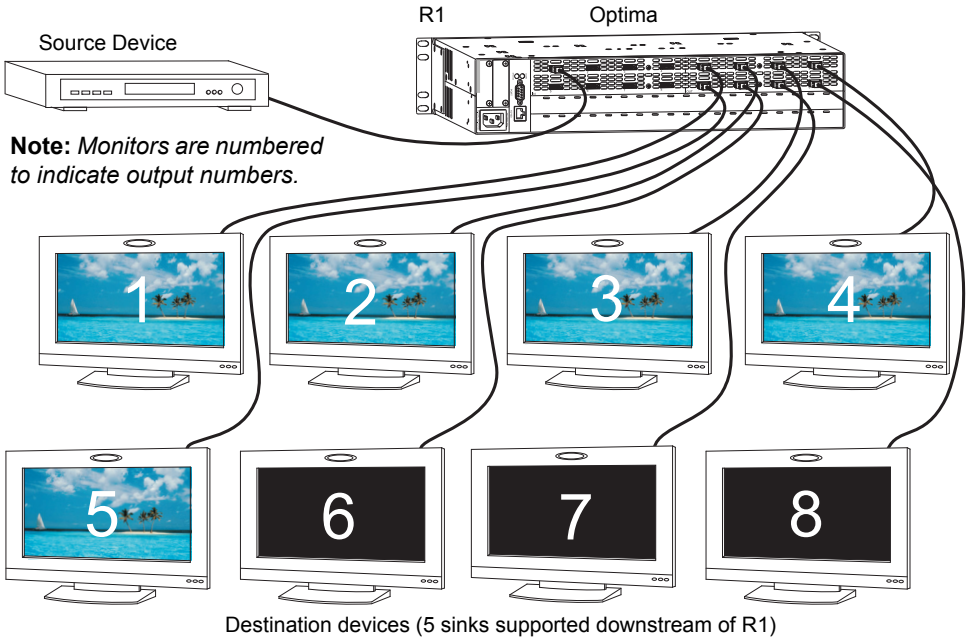


FIG. 46 Determining sink support

The previous process works for verifying sink support for a source device up to 8 sinks. If the process did not cover the needs of the installation (extra repeaters, etc.), continue with the next one until full system capabilities are mapped out.

The next process works for determining if additional sinks are supported by the source device up to a maximum of 16 downstream of the Optima.

Even though the connected source device may support more than 16 sinks, the Optima HDMI board only supports 16 sinks per input. The Optima board will not allow the source device to route its signal to more than 16 sinks downstream of the Optima.

To determine sink support maximum from 8 up to 16 on a source device:

1. If not already completed, complete the previous instructions.
2. Disconnect the first destination device from the HDMI board and connect a new destination device in its place (this increases the total number of sink devices by one). (Alternatively, attach an HDCP supported repeater to the output, and attach the repeater to the same destination device.)
3. Repeat Step 2 for the remaining outputs until either all 8 destination devices show the image from the source or a failure point is reached.

Dealing with Sources with Limited Sink Support

For sources with limited sink support, the following system design considerations and control suggestions are provided.

System Design Considerations

- If at all possible, replace the source device with one with that supports more sinks.
- If a repeater is connected between the source and the HDMI board and the repeater is not necessary, remove the repeater and connect the source device directly to the Optima input. The Optima becomes the first repeater and one sink is eliminated, allowing you to add one more destination to the system.
- If a repeater is connected between the HDMI board and a display device and the repeater is not necessary, remove the repeater and connect the display device directly to the Optima output. This eliminates the one sink, allowing you to add one more destination to the system.

Example of Reducing Sinks:

A reduction in sinks can be made by removing unnecessary repeaters either upstream or downstream of the Optima.

If a source supports five sinks downstream of the first repeater and the sinks (repeaters and destination devices) total six, removing a repeater will reduce the number to five. In this example, the source will *not* transmit the protected content until the number of sinks is reduced to five or less.

Important: *If the repeater that is removed is downstream of the Optima, you will need to clear the Optima input's sink key cache and then persist the cleared state to eliminate the key(s) before routing the source to any of the destinations; for instructions, see page 83.*

Control Suggestions

Either a controller or a modified configuration file can provide a workaround for sources with limited sink support.

- Program an external controller so that the source(s) can only be routed to a limited number of specific destination devices.
- Use XNConnect to create a virtual matrix (VM) that limits routing of the source(s) to a limited number of specific destination devices (see the next page).

External Controller

For control programming information for an Optima using an external controller, see the external controller's documentation.

Tip: *Locking the control panel after routing the desired sources can prevent accidental switching of a source to more sinks than it supports and the resulting need to empty the cache and go through the initial authorization process again. For locking instructions, see the control panel documentation.*

XNConnect

XNConnect can be used to create virtual matrices (VMs) which limit the routing of a source to specific destinations.

Caution: *Virtual matrix modifications are an advanced feature of XNConnect that should not be attempted unless you are extremely familiar with XNConnect and the AMX AutoPatch Distribution Matrix being configured.*

To create new virtual matrices, we recommend contacting technical support (see page 38). If you decide to create them yourself, see page 139 or the XNConnect Help file.

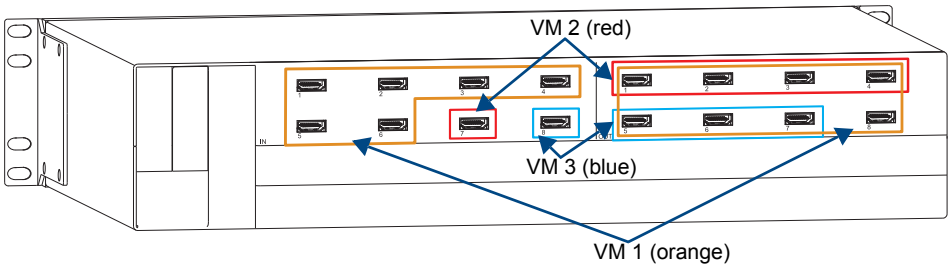


FIG. 47 Example of VMs created for control of sources with limited sink support

Example of Creating VMs (FIG. 47):

The virtual matrices in this example assume no repeaters are used upstream or downstream of the Optima.

- VM 1 – The sources connected to the inputs in orange (Inputs 1 through 6) each support 8 sinks and can be routed to any or all of the outputs in orange on VM 1 (Outputs 1 through 8).
- VM 2 – The source connected to the input in red (Input 7) supports only 4 sinks and can be routed to any or all of the outputs in red on VM 2 (Outputs 1, 2, 3, and 4).
- VM 3 – The source connected to the input in blue (Input 8) supports only 3 sinks and can be routed to any or all of the outputs in blue on VM 3 (Outputs 5, 6, and 7).

Note: *When an input is routed to an output that is already receiving a signal on a different VM, the previous signal is disconnected and the new one takes its place.*

Troubleshooting Audio

Before troubleshooting audio, it helps to understand how the system handles EDID information.

- The Optima reads the destination's EDID to verify that it is HDMI capable.
- The source reads and adapts to the EDID on the Optima HDMI input connector. The factory default EDID is set to support Dolby, DTS, and high PCM frequencies. This EDID can be modified by using one of the methods described under "Possible Solutions" on the next page.

Important: *The Optima does not pass the EDID information from the destination back to the source, which means the source does not know what the destination's EDID is nor can the source make any destination dependent changes.*

Audio Problems

If the destination device does not output the audio or if the audio crackles, it may indicate that the destination device does not support all of the features in the default EDID on the Optima HDMI input connector. Some sources can choose what signal types (audio and video) they are sending to a destination based on the destination's EDID. Therefore, connecting the source directly to the destination may work fine because the source chooses, for example, PCM rather than Dolby (since it knows the destination cannot handle the Dolby). Then when the Optima is installed between the source and the destination, the source reads the Optima HDMI input's default EDID and so it sends Dolby. But if the destination cannot handle Dolby, the signal will not work.

Possible Solutions

One thing to try is to use the EDID Programmer to read the EDID from the destination device (see page 158) and to write it to the Optima 8x8 HDMI input (see page 159).

Another thing to try is to use the EDID Programmer to write an EDID that best represents the downstream destination to the HDMI input connector. Check the "EDID Library" file at **www.amx.com** (search for EDID Library) to determine if one of the custom EDID files (which are variants of base EDIDs) meets your needs. For additional information on custom EDID files, see page 160.

Initializing InstaGate® Technology

InstaGate® technology significantly reduces latency (time required for authentication) in the matrix switcher for HDCP negotiations with the displays in a system. The latency is typically experienced when HDCP authenticates HDMI source and destination devices. This technology effectively "opens the gate" by pre-authorizing the connected source and destination devices to satisfy HDCP authentication.

After the first time a sink is validated by a source, when the source is routed to that same sink, the time required to authenticate that sink is greatly reduced and protected content is displayed with less delay.

Note: *Some destination devices have a longer lag time than others between receiving a signal and displaying that signal. Although InstaGate® significantly reduces latency in the matrix switcher, it cannot reduce the inherent lag time of a device.*

When the system is initially set up, each first time switch to an output *must* go through the lengthy authentication process. After the initial authentication, the system "remembers" the destination device and significantly reduces the latency.

Note: *If necessary, EDID Programmer software (located on the "AMX AutoPatch CD" or at **www.amx.com**) is available for re-programming the HDMI connectors (see page 155).*

We recommend using either of the following procedures at installation or whenever source and/or destination devices are changed, so that the system is primed to accept all destinations (given any limitations on the number of sinks each source supports; see page 75).

To initialize (prime) system for InstaGate® technology with control panel or software:

Note: *The following process can take up to as much as a minute and a half for each one-to-all routing command to complete.* It is normal for the remaining monitors to lose content as each new output is added.*

1. Check to be sure all source and destination devices attached to the HDMI board are powered up.
2. Route each input to all of the outputs.
   Or
   Route each input to all of the runtime intended outputs.

* Time for initial authentication can vary noticeably for different source and destination devices.

To initialize (prime) system for InstaGate® technology using BCS commands:

1. Check to be sure all source and destination devices attached to the HDMI board are powered up.
2. Plug one end of a null modem serial cable into the Control (RS-232) port on the enclosure. The pinout for the DB-9 connector is: 5 GND to 5 GND, 2 RXD to 3 TXD, and 3 TXD to 2 RXD.

3. Plug the other end of the serial cable into the serial port on the PC.
4. Open HyperTerminal (typically at start/Programs/Accessories/Communications/HyperTerminal) or another terminal emulation program.
5. Select the COM port and check that the settings match those in the Optima Serial Port Settings table to the right. If the COM port settings do not match, enter the applicable values from the table.
   Click OK.
6. Apply power to the Optima.
   A short splash screen appears.

Optima Serial Port Settings	
Baud Rate	9600
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

Important: *As you enter each of the commands in Step 7, check to be sure all destinations display stable video. If a destination (sink) does not support HDCP, its display will turn solid red. (If any of the commands fail, try routing the input to each output individually.)*

7. Enter the following sequence of commands, which routes each source to all destinations.
   (Each one-to-all command can take up to as much as a minute and a half to complete.* It is normal for the remaining monitors to lose and then regain content as each new output is added.)

```
CI1O*T
CI2O*T
CI3O*T
CI4O*T
CI5O*T
CI6O*T
CI7O*T
CI8O*T
```

   Or

   Route each input to all runtime intended outputs with BCS commands.

As the process is completed, the keys for the destination devices are stored in the Optima HDMI input's sink key cache.

The HDMI I/O board caches the keys and continuously sends them to the source (in a cumulative manner) even if the source is only connected to a single output at a time. If that single input has been switched to more of the outputs than its sink key cache will support, the source device will fail.

* Time for initial authentication can vary noticeably for different source and destination devices.

Note: *For additional information on BCS commands, see the "Instruction Manual – BCS Basic Control Structure Protocol" on the "AMX AutoPatch CD" or at* ***www.amx.com****.*

The HDMI Board's Sink Key Cache

If you need to persist the sink key cache on the HDMI board or clear persistence of the cache, follow the instructions provided. This procedure requires a terminal program such as HyperTerminal.

Command to Persist (Save) Sink Key Cache

The HDMI I/O board uses the BCS command `~app!` (warm boot) to save the sink key cache on all of its inputs.

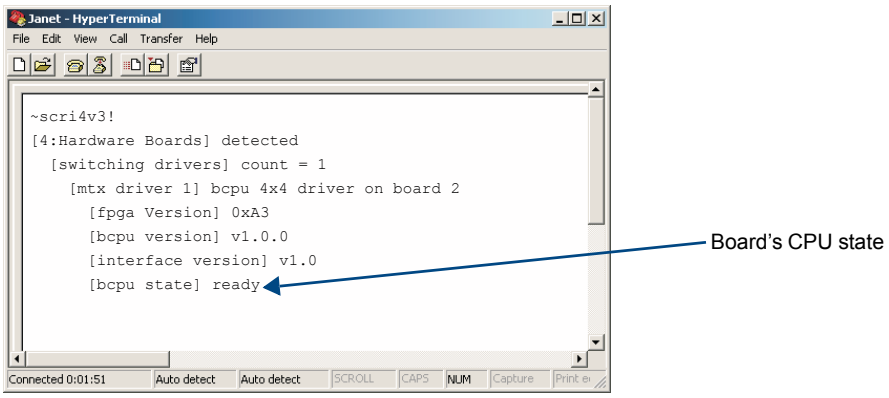
Note: *The command also persists the routing state of the entire system.*

Important: *These commands apply to the routing state of the entire system. All HDMI boards in the system receive the request. These commands cannot be sent to a specific board or specific input.*

The board's CPU *must* be in a "ready" state before the command is sent. The ready state can be determined on the splash screen.

To persist Sink Key cache on all HDMI I/O boards in a system:

1. Enter `~scri4v3!`
   The "bcpu state" (board's CPU state) *must* say `ready`.



2. Complete the procedure for initializing the system for InstaGate® technology starting on page 81.
3. Enter `~app!` (persists the empty cache).
   The Optima will warm boot and display its boot screen.

Command to Clear Persistence of the Sink Key Cache

The HDMI I/O board uses the BCS command `@et` to clear the sink key cache on all of its inputs. Note that the response to the `@et` command is `@ev`.

Note: *The command also clears the routing state of the entire system.*

Important: *All HDMI boards in the system receive the request. This command cannot be sent to a specific board or to specific inputs.*

To clear persistence of sink key cache on all HDMI I/O boards in a system:

1. Enter `~scri4v3!`
   The "bcpu state" (board's CPU state) *must* say `ready`.
2. Enter `@et` (clears the cache and disconnects all currently routed signals).
   Note that the response to the `@et` command is `@ev`.
3. Enter `~app!` (persists the empty cache).

S/PDIF and TosLink® Digital Audio I/O Boards

Applicability Notice

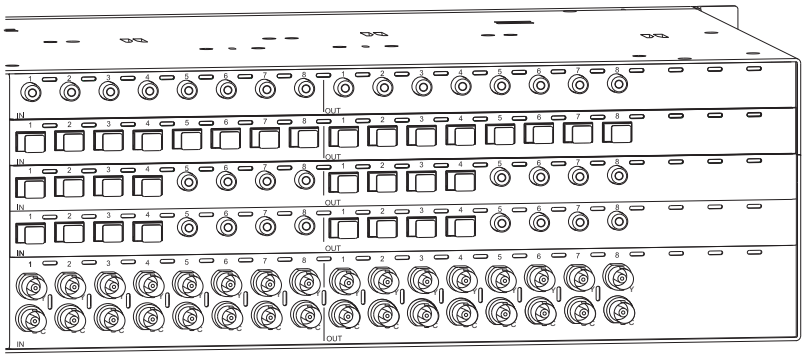


FIG. 48 S/PDIF and TosLink digital audio I/O boards (shown with a Y/c board)

This chapter pertains to Optima digital audio input/output boards with S/PDIF (coaxial) and TosLink (optical) connectors contained in pre-engineered systems and custom systems.

S/PDIF and TosLink Digital Audio I/O Boards	
Note: *Specifications for the following boards are listed below and on page 86.*	
Configuration	**Board Part #**
8x8 S/PDIF (coaxial)	FG1046-458
8x8 TosLink (optical)	FG1046-455
8x8: 4 S/PDIF + 4 TosLink (coaxial and optical)	FG1046-461

TosLink® is a registered trademark of the Toshiba Corporation.

S/PDIF Digital Audio I/O Boards Specifications

Applies to I/O board FG1046-458 and to coaxial connectors on the combination I/O board FG1046-461.

These boards come in a number of pre-engineered systems or can be ordered individually for custom systems.

Specifications	
Resolution	16 bit to 24 bit
Sample Rate	32 kHz, 44.1 kHz, 48 kHz, 96 kHz
Input Signal Amplitude	0.2 Vpp to 2.5 Vpp terminated
Output Signal Amplitude	0.4 Vpp to 1.0 Vpp terminated into 75 ohm
Rise and Fall Time	<20 nS
Jitter	<5 nS
CDR (Relocking)	Yes
Connector	RCA (coaxial)

TosLink Digital Audio I/O Boards Specifications

Applies to I/O board FG1046-455 and to optical connectors on the combination board FG1046-461.

These boards come in a number of pre-engineered systems or can be ordered individually for custom systems.

Specifications	
Resolution	16 bit to 24 bit
Sample Rate	32 kHz, 44.1 kHz, 48 kHz, 96 kHz
Output Rise and Fall Time	<20 nS
Jitter	<5 nS
CDR (Reclocking)	Yes
Connector	Optical

AMX reserves the right to modify its products and their specifications without notice.

Attaching Cables

When attaching digital audio input and output cables, refer to the sheet labeled "AutoPatch Connector Guide" that ships with the system. The sheet shows you where to attach each cable on the rear of each enclosure. Follow the sheet exactly; the system was programmed at the factory to operate *only* as indicated on the sheet. For multiple-enclosure systems, each enclosure will be numbered (e.g., "Chassis 1 of 3") on a label located on the left side near the power receptacle.

Attaching Digital Audio Cables

Signals may only be routed from the inputs on a board to the outputs on the same board because each board has its own switching matrix.

To attach S/PDIF digital audio input and output cables:

1. Insert S/PDIF digital audio (coaxial) plugs into the S/PDIF digital audio jacks (FIG. 49).

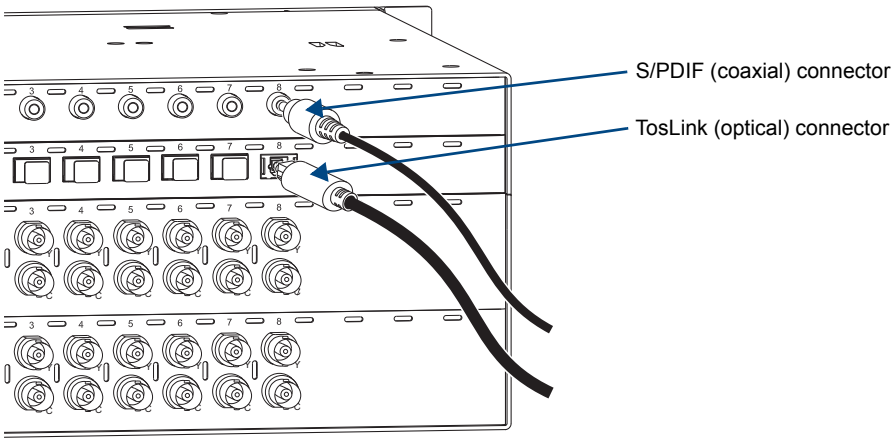


FIG. 49 Attaching S/PDIF and TosLink digital audio connectors

To attach TosLink digital audio input and output cables:

1. Remove the protective caps from the TosLink jacks.
2. Insert TosLink digital audio (optical) plugs into the TosLink digital audio jacks (FIG. 49).

Stereo Audio I/O Boards

Applicability Notice

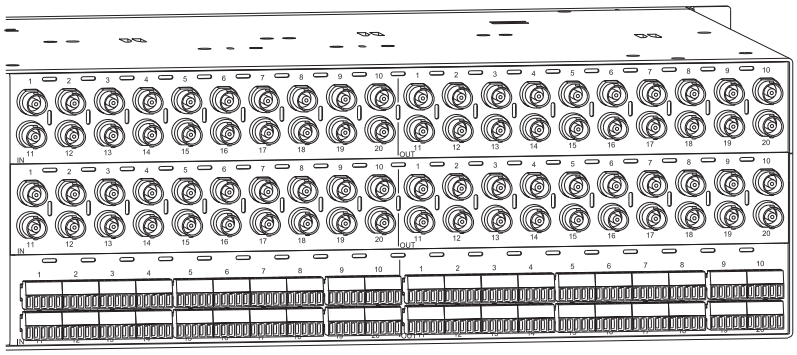


FIG. 50 A stereo audio board (shown with two video boards)

This chapter pertains to Optima stereo audio input/output boards contained in pre-engineered systems and custom systems. The table below provides information on the types of stereo audio boards and their numbers.

Stereo Audio I/O Boards with Digital Gain Control	
Note: *Specifications for these boards are listed on page 88.*	
Configuration	**Board Part #**
8x4	FG1046-539
8x8	FG1046-494
16x16	FG1046-533
16x24	FG1046-548
20x4	FG1046-473
20x20	FG1046-416
24x4	FG1046-500
24x16	FG1046-434
36x4	FG1046-425

Stereo Audio I/O Boards Specifications

Applies to I/O boards FG1046-416, FG1046-425, FG1046-434, FG1046-473, FG1046-494, FG1046-500, FG1046-533, FG1046-539, and FG1046-548.

These boards come in a number of pre-engineered systems or can be ordered individually for custom systems.

Specifications		
Parameter	**Conditions**	**Value**
Frequency Response	20 Hz to 20 kHz	<±0.2 dB
THD + Noise	f = 20 Hz to 20 kHz, Vin = -10 to +10 dBu f = 20 Hz to 20 kHz, Vin = 0 to +22 dBu	<0.03% <0.01%
Crosstalk	f = 1 kHz, Vin = +20 dBu	<-110 dB
Channel Separation	f = 1 kHz, Vin = +20 dBu	>100 dB
Signal to Noise Ratio (SNR)	20 Hz to 20 kHz, Vin = +20 dBu	>120 dB
CMRR	20 Hz to 20 kHz	>80 dB
Input Level (max.)	Balanced	+22 dBu
Input Impedance		18 kohms
Input Gain Adjustment Range	Control panel or serial control	±10 dB
Output Level (max.)	Balanced	+22 dBu
Output Impedance		50 ohms
Output Volume Control Adjustment Range*	Control panel or serial control	+10 dB to -70 dB (mute)
Connector Type		Pluggable 5-position terminal block

* Total of input gain plus output gain cannot exceed +10 dB.

AMX reserves the right to modify its products and their specifications without notice.

Attaching Wires

When attaching stereo audio input and output wires, refer to the sheet labeled "AutoPatch Connector Guide" that ships with the system. The sheet shows where to attach the wires on the rear of each enclosure. Follow the sheet exactly; the system was programmed at the factory to operate *only* as indicated on the sheet. For multiple-enclosure systems, each enclosure will be numbered (e.g., "Chassis 1 of 3") on a label located on the left side near the power receptacle.

Signals may only be routed from the inputs on a board to the outputs on the same board because each board has its own switching matrix.

To attach stereo audio input and output wires:

1. Unscrew the clamps on the audio connector.
2. Insert the wires (FIG. 51) for wire placement for balanced and unbalanced audio) and firmly re-tighten the clamps to make proper connections.

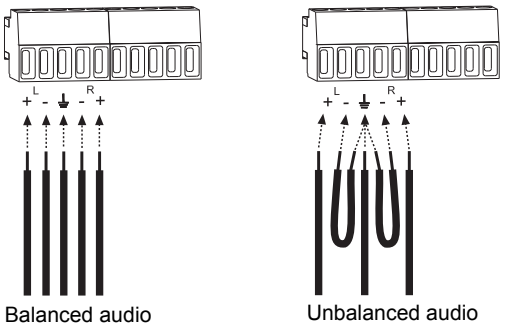


FIG. 51 Balanced and unbalanced stereo audio wiring

Note: *For stereo audio signals using twisted pair wire, connect the shield (ground) only at one end (recommend receiving end) to minimize low frequency noise.*

Wiring Sources and Destinations

Source and destination devices will require either balanced (differential) or unbalanced (single-ended) connections. FIG. 52 illustrates the options for wiring between the sources and the input connectors and between the output connectors and the destinations. More than one of these options can be used in the same system. For balanced and unbalanced wiring details, see FIG. 51.

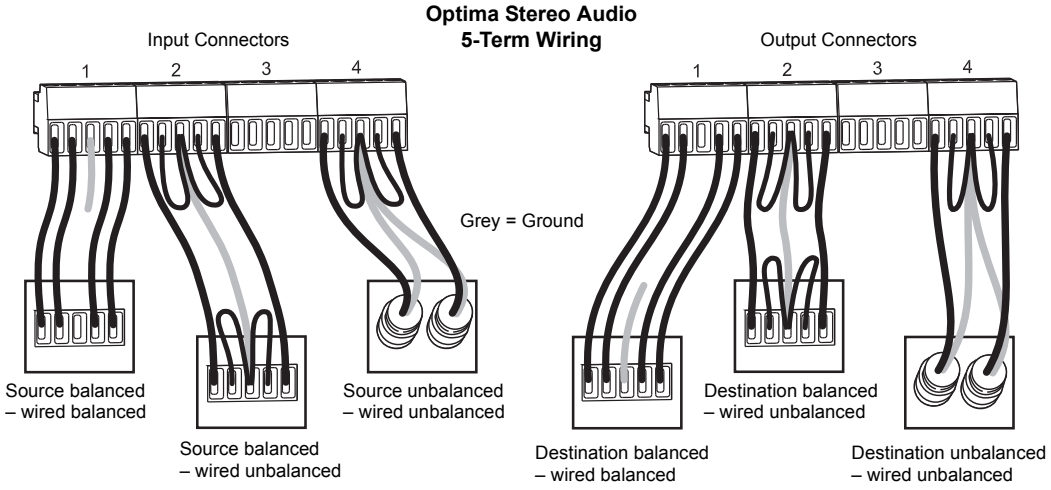


FIG. 52 Options for source-to-Optima-to-destination 5-term wiring

Adjusting Output Volume

Volume (Digital Gain)

Output volume can be adjusted using either a control panel with volume adjustment (see the control panel's *Instruction Manual*) or BCS (Basic Control Structure) commands from an external controller.

BCS Volume Adjustment

Volume can be adjusted using one of three BCS command methods: Absolute, Relative, or Increment/Decrement. Directions for adjusting volume using the Absolute Method (adjusting volume *to* a specific decibel level) are given below. Information and instructions for the other two methods can be found in the *Instruction Manual – BCS Basic Control Structure Protocol* on the *AMX AutoPatch CD* or at **www.amx.com**.

To adjust volume using the BCS Absolute Method:

1. Enter the Volume Absolute command using the format below. Replace the "#"s with the level number and the output number, and replace "^^^" with the decibel level. Enter the decibel level as a decimal number to the tenth place without the decimal point (e.g., –31.5 dB is entered as -315).
   `CL#O#VA^^^T`

Example

Adjust the volume to +10 dB for Output 3 on Level 0 (VM 0) by entering the following BCS command line: `CL0O3VA100T`

Note: *The total through-system gain (the amount of input gain plus the amount of output gain) specified for any input to output routing path cannot exceed 10 dBr. If a volume command is entered that exceeds 10 dBr when it is combined with the gain of an input, the command will be accepted (and will be indicated in status results) but will not result in an audible difference of more than 10 dBr.*

Adjusting Digital Input Gain

If a board supports digital input gain, adjustments can be made at any time during normal operation using either a control panel with input gain adjustment (see the control panel's *Instruction Manual*) or BCS commands.

Inputs are set to unity gain at the factory and have a gain adjustment range of -10 dB to +10 dB.

Caution: *We strongly recommend that input gain adjustment be made only by a qualified installer or dealer.*

Adjusting input gain (the nominal level of the signal from the source device) allows source signals of varying amplitudes to be equalized before they are routed and the volume is adjusted. Equalizing source levels provides a consistent reference for volume adjustments and eliminates jumps when routing a new input to an output. Input gain adjustment is also used for equalizing amplitudes between balanced and unbalanced inputs.

To equalize input levels by adjusting input gain:

1. Route the first input (source) to an output (destination).
2. Adjust the input gain for the source to a specific dB level (see page 91).
3. Repeat for all inputs that will be routed to the same output.

Note: *The total through-system gain (the amount of input gain plus the amount of output gain) specified for any input to output routing path cannot exceed 10 dBr. If an input gain command is entered that exceeds 10 dBr when it is combined with the gain (volume) of an output, the command will be accepted (and will be indicated in status results) but will not result in an audible difference of more than 10 dBr.*

To adjust digital input gain using the BCS Absolute Method:

1. Enter the command below. Replace the "#"s with the level and input number(s) and replace "^^^" with the decibel level. Enter the decibel level as a decimal number to the tenth place without the decimal point (e.g., -5 dB is entered as -50).
   `CL#I#VA^^^T`

Example

Adjust the input gain of Input 4 to +10 dB on Level 2 (VM 2) by entering the following BCS command line: `CL2I4VA100T`

Note: *Alternative methods for adjusting input gain with BCS commands can be found in the "Instruction Manual – BCS Basic Control Structure Protocol."*

RGBHV+Stereo to CatPro I/O Boards (with RX Modules)

Applicability Notice

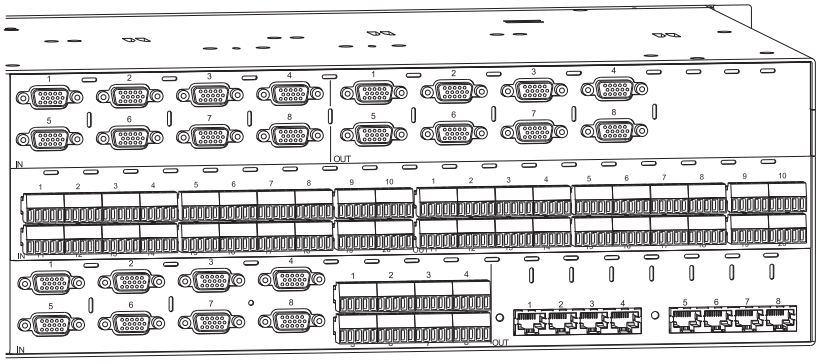


FIG. 53 An 8x8 RGBHV+Stereo to CatPro I/O board (shown below an RGBHV/HD-15 board and a stereo audio board)

This chapter pertains to Optima RGBHV+Stereo to CatPro input/output boards contained in pre-engineered systems and custom systems. The table below shows the types of RGBHV+Stereo to CatPro boards and their numbers.

RGBHV+Stereo to CatPro I/O Boards	
Note: *Specifications for the following boards are listed on page 94.*	
Configuration	**Board Part #**
4x8	FG1046-581
8x8	FG1046-575

The outputs on the Optima CatPro boards act as transmitters (TXs) and *must* be used in conjunction with a CatPro RGBHV+Stereo Receiver (RX) Module FG1010-48-01 (see below) to make up a complete system. For information on system setup, see page 100.

Note: *Specifications for the RX module are listed on page 96.*

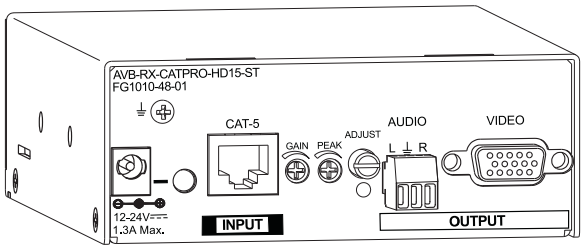


FIG. 54 CatPro RGBHV+Stereo RX Module (rear view)

RGBHV+Stereo to CatPro Boards I/O Boards Specifications

RGBHV+Stereo to CatPro board specifications were measured in conjunction with CatPro RGBHV+Stereo RX Modules using Cat5e cable (for module specifications, see page 96).

Applies to I/O boards: FG1046-575, FG1046-581.

These boards come in a number of pre-engineered systems or can be ordered individually for custom systems.

Specifications

Parameter	Conditions	Value
Maximum Resolution	@ 60 Hz up to 1000 ft. (305 m)	1600x1200* (4:3) 1920x1080p (16:9)
RGB Crosstalk	f = 5 MHz f = 30 MHz	<-60 dB <-45 dB
RGB Signal to Noise Ratio (SNR)	Vin = 0.7 V, 100 IRE	>50 dB
RGB Input Signal Level Range (max.)		+0.75 V to -0.3 V typical (terminated)
RGB Return Loss	f = 5 MHz	<-55 dB
RGB Input Impedance		75 ohms
Sync Input Impedance		2.2 kohms
Sync Input Polarity	Active high or low	Output follows input polarity
Audio Frequency Response	20 Hz to 20 kHz	<±0.3 dB
Audio THD+Noise	1 kHz, -10 dBu to +4 dBu	<0.04%
Audio Crosstalk	1 kHz, Vin = +4 dBu	<-95 dB
Audio Signal to Noise Ratio (SNR)	20 Hz to 20 kHz, Vin = +8 dBu	>85 dB
Audio Input Level (max.)		+8 dBu
Audio Input Impedance		18 kohms
RGB Output Signal Level Range (max.)		+0.75 V to -0.3 V typical (terminated, user adjustable with gain and peak using CatPro RX)
RGB Output Skew Adjustment		0 to 62 ns, in 2 ns increments on R, G, and B channels (user adjustable using CatPro RX)
RGB Output Impedance		75 ohms
Sync Output Signal Level		Low = 0 V, High = +5 V (unterminated)
Sync Output Polarity	Active high or low	Output follows input polarity
Audio Output Level (max.)		+8 dBu
Audio Output Impedance		<5 ohm
Audio Output Volume Adjustment Range		Mute to +6 dB (user adjustable at CatPro RX)
Signal Types		Input: RGBHV+Stereo Audio (balanced or unbalanced) Output: CatPro RGBHV+Stereo Audio (unbalanced)
Connector Types		Input: HD-15 and pluggable 5-position terminal block Output: Female RJ-45
Supported Twisted Pair Cable Types		Category cable 5, 5e, 6, 6e, and STP All measurements taken using Cat5e.

* Signals displayed using a resolution of 1600x1200 at 60 Hz may exhibit slightly visible background noise in certain circumstances (particularly with LCD monitors).

Note: *Skew-free cable is not recommended for use with AMX AutoPatch equipment.*

EDID Resolutions Supported through Local DDC*

Standard and established timings are provided in the tables below.

Standard Timings

Standard Timing Identification	Resolution	Refresh Rate Max.**
ID 1	1600x1200 (This is the preferred timing identified in the EDID.)	75 Hz
ID 2	640x480	120 Hz
ID 3	1024x768	120 Hz
ID 4	1280x1024	85 Hz
ID 5	800x600	120 Hz
ID 6	1152x864	120 Hz
ID 7	1600x1200	60 Hz
ID 8	1280x800	60 Hz

* Additional resolutions may be supported through local DDC.
** Some monitors may not support the maximum refresh rate.

Established Timings

Resolutions	Refresh Rate Max.**
720x400	70 Hz, 88 Hz
640x480	60 Hz, 67 Hz, 72 Hz, 75 Hz
800x600	56 Hz, 60 Hz, 72 Hz, 75 Hz
832x624	75 Hz
1024x768	60 Hz, 70 Hz, 75 Hz, 87 Hz
1280x1024	75 Hz
1152x870	75 Hz

* Additional resolutions may be supported through local DDC.
** Some monitors may not support the maximum refresh rate.

CatPro RGBHV+Stereo RX Module Specifications

Applies to: CatPro RX Module FG1010-48-01.

General Specifications	
Approvals	CE, UL, cUL
Signal Types	RGBHV, stereo audio (audio is unbalanced)
Maximum Resolution	1600x1200 (4:3) and 1920x1080p (16:9) @ 60 Hz up to 1000 ft. (305 m)*
Supported Twisted Pair Cable Types	Cat5, Cat5e, Cat6, Cat6e, and STP (skew-free cable is not recommended) All measurements were taken using Cat5e cable.
Power In Connector	2.1 mm DC power jack
Power Consumption (max.)	+12 V to +24 V DC @ 6 Watts
Thermal Dissipation (max.)	20 BTU/hr.
Humidity	0 to 90% non-condensing
Operational Temperature	32° F to 110° F (0° C to 43° C)
Dimensions Depth Width Height	 5.15 in. (13.08 cm) 5.80 in. (14.73 cm) 1.66 in. (4.221 cm) w/out feet
Weight	Approx. 1.3 lb. (0.6 kg)

* When used in conjunction with an AMX AutoPatch Distribution Matrix, the overall cable length cannot exceed 1,000 feet (305 m).

RGBHV+Stereo Audio Specifications at 1000 ft. (305 m)		
Parameter	**Conditions**	**Value**
RGB Out		
Signal Level Range	Terminated, user adjustable with gain and peak	+0.75 V to -0.3 V typical
Impedance		75 ohms
Signal to Noise Ratio (SNR)		>50 dB
Skew Adjustment	User adjustable	0 to 62 ns in 2 ns increments on R, G, and B channels
Sync Out		
Signal Level	Unterminated	Low = 0 V, High = +5 V
Polarity	Active high or low	Output polarity follows input polarity
Audio Out		
Signal Level (max.)		+8 dBu
Frequency Response	20 Hz to 20 kHz	<±0.2 dB
THD+Noise	f = 1 kHz, Vin = -10 dBu to +4 dBu	<0.04%
Signal to Noise Ratio (SNR)	f = 20 Hz to 20 kHz, Vin = +4 dBu	>105 dB
Impedance		<5 ohms
Volume Adjustment Range	User adjustable with the RX Module	Mute to +6 dB
Connector Types RGBHV+Stereo In RGBHV Out Stereo Audio Out		 RJ-45 HD-15 Pluggable 3-position terminal block

AMX reserves the right to modify its products and their specifications without notice.

Attaching Cables and Wires

Important: *Before attaching cables and wires – For important information on CatPro system equipment requirements, see page 100. For information on setting up a CatPro system before attaching cables and wires, see page 101.*

When attaching input and output cables and wires, refer to the sheet labeled "AutoPatch Connector Guide" that ships with the system. The sheet shows where to attach the cables and wires on each enclosure. Follow the sheet exactly; the system was programmed to operate *only* as indicated on the sheet. For multiple-enclosure systems, each enclosure will be numbered (e.g., "Chassis 1 of 3") on a label located on the left side near the power receptacle.

Important: *To guarantee 1,000 ft. (305 m) skew compensation, the inter-pair skew must equal <20 ns/ 100 m. Pre-installed cables should be tested for skew. Cables will work if they test less than 62 ns skew and are within 1,000 ft. (305 m).*

CatPro Supported Twisted Pair Cable Types

- Cat5
- Cat5e
- Cat6
- Cat6e
- STP (Shielded Twisted-Pair)

Note: *Skew-free cable is not recommended for use with AMX AutoPatch equipment.*

Signals may only be routed from the inputs on a board to the outputs on the same board because each board has its own switching matrix.

To attach CatPro (RJ-45) outputs:

1. Insert the RJ-45 cable connector into the output RJ-45 receptacles (FIG. 55).

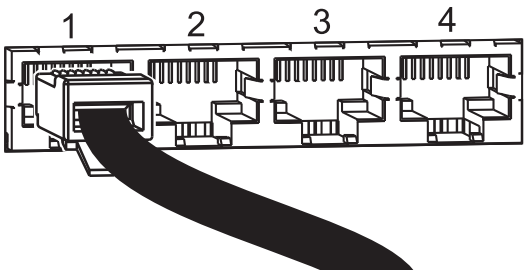


FIG. 55 Insert RJ-45 connector into RJ-45 receptacle

To connect HD-15 inputs:

1. Fasten the cables onto the input HD-15 connectors (FIG. 56).

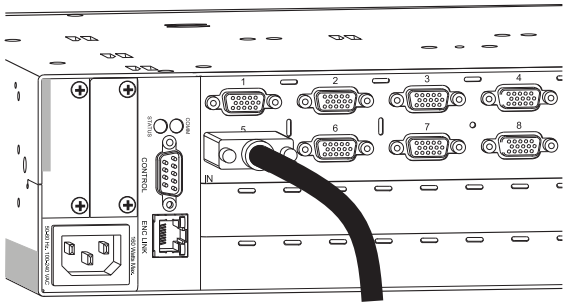
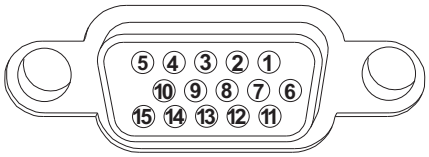


FIG. 56 Fasten cable onto HD-15 connector

HD-15 Board Connector Pinout

Pinout information for the High Density HD-15 connector on the RGBHV+Stereo to CatPro I/O board is provided with FIG. 57.



RGBHV+Stereo to CatPro I/O Board HD-15 Connector Pinout		
Input (VESA DDC Compliant)		
1. Red	6. Red GND	11. ID Bit
2. Green	7. Green GND	12. DDC SDA
3. Blue	8. Blue GND	13. Horizontal sync
4. ID Bit	9. +5 VDC in DDC	14. Vertical sync
5. GND	10. GNC	15. DDC SCL

FIG. 57 Pinout for I/O board HD-15 connector

To attach stereo audio inputs (pluggable 5-position terminal block):

1. Unscrew the clamps on the audio connector.
2. Insert the wires (for wire placement for balanced and unbalanced audio, see FIG. 58) and firmly re-tighten the clamps to make secure connections.

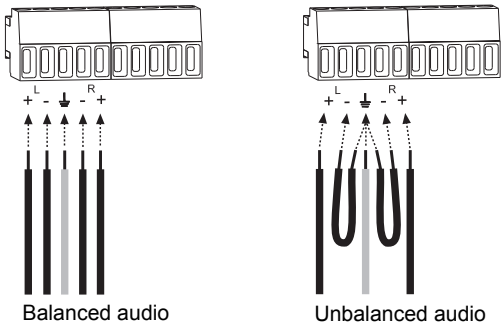


FIG. 58 Balanced and unbalanced stereo audio wiring

Note: *For stereo audio signals using twisted-pair wire, connect the shield (ground) only at one end (recommend receiving end) to minimize low frequency noise (FIG. 59 on page 99).*

Wiring Sources

Source devices will require either balanced (differential) or unbalanced (single-ended) connections. Options for wiring between the sources and the input connectors are illustrated in FIG. 59 below. More than one of these options can be used in the same system. For balanced and unbalanced wiring details, see FIG. 58 on the previous page.

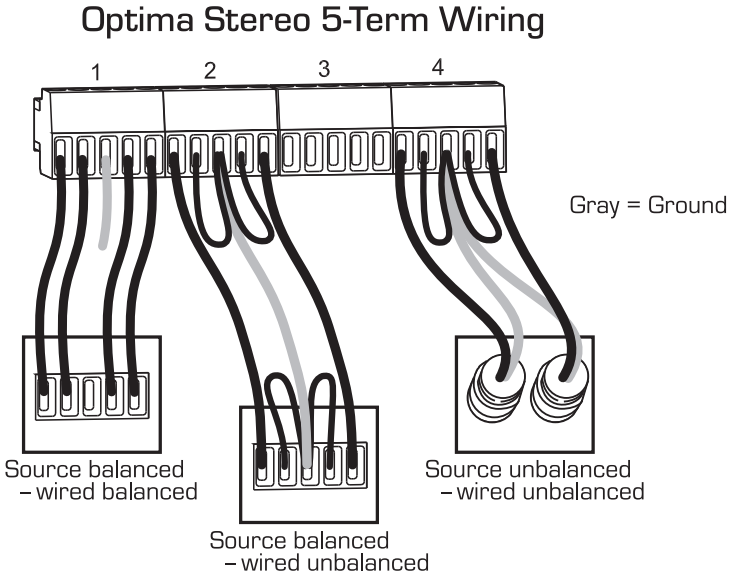


FIG. 59 Options for source-to-Optima 5-Term wiring

To attach outputs and power to the RX Module:

1. Fasten the HD-15 cable (FIG. 60) onto the Video Output connector.

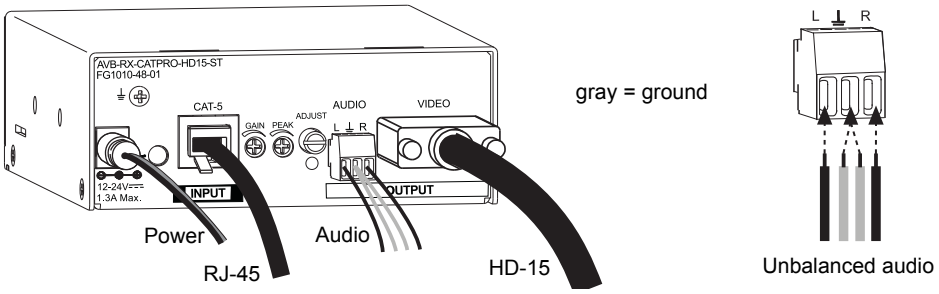
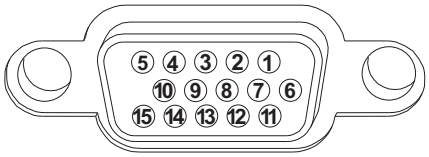


FIG. 60 CatPro RX Module connectors and audio wiring

2. Wire the audio connector (FIG. 60 right shows unbalanced audio).
3. Insert the RJ-45 connector into the CAT-5 receptacle.
4. If using the AMX AutoPatch power supply provided – Plug the desktop power supply into the power jack on the module and into an AC external power source.
   Or
   If you are providing the power supply – Plug the power cord from a UL (or equivalent) listed power supply into the power jack on the module. The electrical ratings *must* meet those indicated in the specifications table (see page 96).

Note: *For adjustment procedures when CatPro RGBHV+Stereo RX Modules are used in conjunction with Optima CatPro input/output boards, see page 102.*

RX HD-15 Video Out Pinout



RX Module HD-15 Connector Pinout		
Output		
1. Red	6. Red GND	11. ID Bit
2. Green	7. Green GND	12. ID Bit
3. Blue	8. Blue GND	13. Horizontal sync
4. ID Bit	9. +5 VDC out DDC	14. Vertical sync
5. GND-N/C	10. Ground	15. ID Bit

FIG. 61 Pinout for CatPro RX Module HD-15 connector

Note: *55 mA supplied on output pin 9; power draw not to exceed 50 mA per port.*

CatPro System Equipment

A typical Optima CatPro system includes source and destination devices, an RX module, and a PC for setup. See the following for explanations of the equipment and their requirements.

Source Device (PC or other RGBHV video source)

The Source PC is connected to the HD-15 and stereo audio input connectors, which are routed to the RJ-45 output connectors.

Destination Device (Monitor)

The Destination Monitor receives signals from the Source PC via the CatPro RX Module. Adjustments made on the CatPro RX Module are reflected on the Destination Monitor. When making display adjustments, open the provided test image* on the Source PC so that it can be routed to the Destination Monitor for display.

* Adobe Acrobat Reader is required to view the provided test image .pdf file. It is a free software program available online at www.adobe.com.

CatPro RX Module FG1010-48-01

The RX Module receives RGBHV and stereo audio signals from the Optima CatPro output board and passes them onto the destination device. Display adjustments are made using the potentiometers and the Adjust knob on the RX Module to clear the image and compensate for skew. The Adjust knob can also be used to adjust the volume.

Modula CatPro Input (RX) Boards (if applicable)

CatPro Input boards in a Modula CatPro enclosure can be used instead of modules. For information on these boards, see the *Instruction Manual – Modula Matrix Switchers* (online at **www.amx.com**).

Control PC and CatPro Wizard

Control PC Requirements

- ❑ Windows 2000© or Windows XP Professional©
- ❑ 2 MB free disk space
- ❑ 15 MB RAM
- ❑ Serial port

The Control PC, which runs the CatPro Wizard software*, connects via a null modem cable to the Control port on the Optima. The Control PC settings and the CatPro Wizard settings (which default to serial port COM 1 and baud rate 9600) *must* match. Once the system is set up and no further changes to the display settings are necessary, the Control PC can be disconnected.

* The CatPro Wizard adjusts the video signal (as seen on the Destination Monitor) to clear the image and compensate for skew.

System Setup

An Optima RGBHV+Stereo to CatPro system works in conjunction with the CatPro RGBHV+Stereo RX Module FG1010-48-01 (see page 93). The CatPro (RJ-45) output connector on the board functions as a transmitter (TX), allowing the signals to be sent over any of the supported cable types to the CatPro RX (Receiver) Module (or to Modula CatPro Input boards) and from there to the destination monitors.

A typical setup is illustrated below. Use the hardware on the module to clear the image by adjusting gain and peak and by compensating for skew.

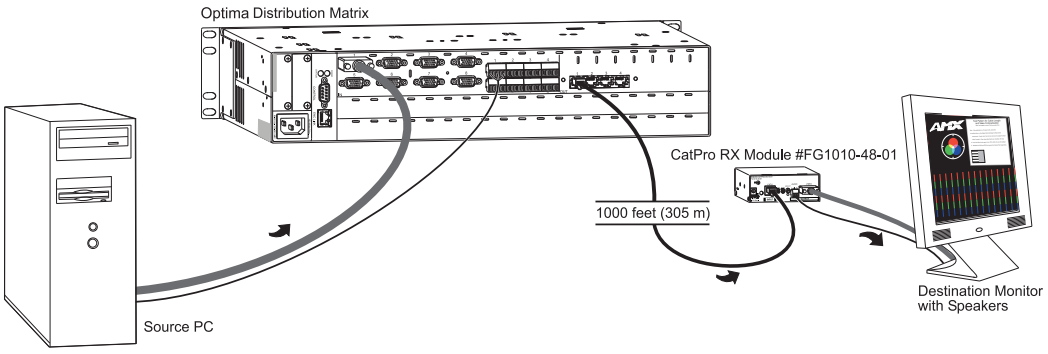


FIG. 62 A typical Optima RGBHV+Stereo to CatPro system

Video Display Adjustment

The image on the Destination Monitor may be unclear or distorted due to the cable length. Adjustments are made on the CatPro RX Module to clear the image and compensate for the skew. Use the potentiometers to adjust the gain and peak, and use the Adjust knob to adjust the skew and volume.

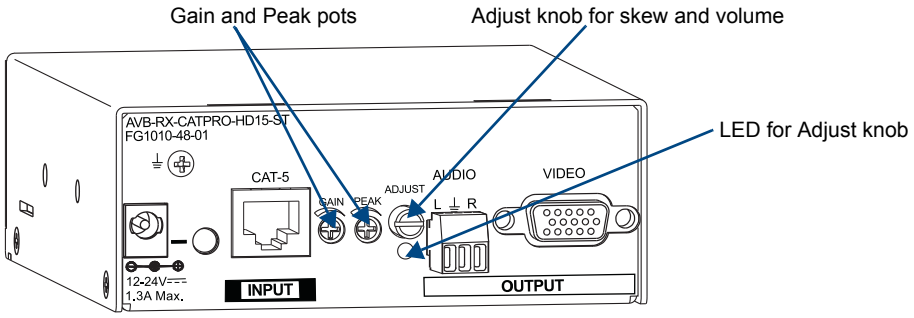


FIG. 63 CatPro RX (Receiver) Module FG1010-48-01

Tip: *Be sure that the source device sending the signal to the display monitor (or device) has a sharp picture before you start.*

Test Image Files

Test image .pdf files for adjusting the display are provided on the *AMX AutoPatch CD* that shipped with the CatPro RX Module(s). The test file is opened* on the Source PC and subsequently displays on the Destination Monitor. The file names for the test image .pdf begin with the resolution (800x600, 1024x768, 1280x1024, etc.) and end with "SkewPattern" (e.g., 1280x1024SkewPattern.pdf). Select the file with the resolution that corresponds to the resolution of the source signal (ideally this should be the native resolution of the Destination Monitor).

* Adobe Acrobat Reader is required to view the test image .pdf file. It is a free software program available online at: www.adobe.com.

Gain and Peak

The Gain and Peak potentiometers on the CatPro RX Module are used to help compensate for the overall cable length.

To adjust the gain and peak using the CatPro RX Module:

1. On the Source PC, open the test image .pdf file that corresponds to the resolution of the Source PC.
2. Route the source to the destination.
   The test image appears on the Destination Monitor (the image will be distorted).

FIG. 64 Test image on Destination Monitor with distorted display

3. If the Destination Monitor's brightness needs to be increased or decreased, turn the Gain potentiometer until the desired brightness is reached.
4. If the picture is not sharp enough, turn the Peak potentiometer. (Increasing the peak removes the graininess.) The image will still be skewed.

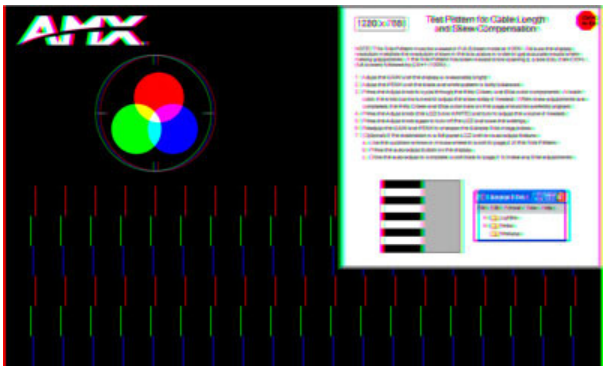


FIG. 65 Test image adjusted for gain and peak (image still skewed)

If the skew was adjusted previously, restore the default settings before proceeding (adjust skew by turning the knob fully counterclockwise for R, G, and B in the steps below and save).

Additional potentiometer fine-tuning may be necessary after adjusting skew.

Skew and Volume

The Adjust knob on the CatPro RX Module can be used to compensate for the skew inherent in the supported cables types by adjusting the video signal to eliminate the skew. It also adjusts the volume. A small screwdriver works well for turning and pressing the knob. The knob does not have a mechanical start or stop point. If the LED blinks when the knob is turned, the setting has reached its minimum or maximum adjustment point.

The CatPro RX Module ships with factory-defined default settings of "no skew delay" for the skew on R, G, and B and for "unity gain" on volume. Once the adjustment process has been successfully completed and saved, the new settings replace the factory settings. The system will restore the new settings whenever power is cycled. If necessary, restore the video factory default by adjusting the R, G, and B fully counterclockwise and restore unity gain by adjusting the audio six clicks left from "full on" (which is blinking); press the Adjust knob to save.

To abort the adjustment procedure at any time:

1. Hold the Adjust knob down until the LED turns amber, then release the knob.
   The LED blinks 3 times and the RX Module reverts to its previous settings.

Cycling power on the CatPro RX Module during the adjustment procedure will have the same effect. Individual settings are not stored in memory until all adjustments (Steps 2 through 10 below) have been made.

To adjust the skew and volume using the CatPro RX Module:

1. If the gain and peak have not already been adjusted, complete the steps on page 102.
2. Press the Adjust knob.
   The LED turns red; the module is placed in Red Skew Adjust mode.
3. Turn the Adjust knob clockwise or counterclockwise until the red color bars align as closely as possible with the green color bars.
4. Press the Adjust knob.
   The LED turns green; the module is placed in Green Skew Adjust mode.

5. Turn the Adjust knob clockwise or counterclockwise, if necessary, to align the green color bars with the red color bars.
6. Press the Adjust knob.
   The LED turns blue; the module is placed in Blue Skew Adjust mode.
7. Turn the Adjust knob clockwise or counterclockwise until the blue color bars align with the red and green color bars.

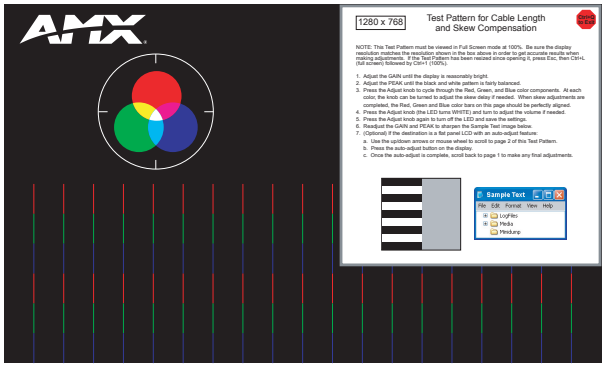


FIG. 66 Test image adjusted for skew

8. Press the Adjust knob.
   The LED turns white; the module is placed in Volume Adjust mode.
9. Turn the Adjust knob clockwise to increase volume or counterclockwise to decrease volume.
10. Press the Adjust knob.
    The LED turns off, and the module saves all of the settings.

To adjust the volume without changing the skew settings:

1. Press the Adjust knob until the LED turns white and then complete Steps 9 and 10 above.

Tip: *For optimal results on flat panel LCDs, use page 2 of the .pdf test image and press the auto-adjust button on the panel after using the potentiometers and the Adjust knob.*

LED Blinks Red and Green

If the LED alternately blinks red and green, a configuration failure has occurred.

- If the blinking happens when the Adjust knob is pressed to save (Step 10), the system failed to save the settings. Any adjustments just made are still in effect, but will be lost the next time power is cycled. Press the Adjust knob; repeat (cycle the colors) until the LED turns off.
- If the blinking happens when power is cycled, the system could not find valid settings and reverted to the factory defined default settings. Complete Steps 2 through 10 again.

Additional fine-tuning with the potentiometers may be necessary. If undesirable display conditions persist, see “CatPro Troubleshooting” on page 105.

CatPro Troubleshooting

Note: *If undesirable display conditions persist after trying the troubleshooting procedures below, contact technical support (see page 38).*

- ❑ Problem: The image does not display or is dark and severely distorted.
- ❑ Solution: Try adjusting the gain and peak on the RX Module.

- ❑ Problem: The image on the destination monitor displays missing, extra, or flickering pixels. This problem may occur because of abnormally high signal amlitues from the source video equipment exeeceding the CatPro's typical RGB range of 0 mv to 700 mv.
- ❑ Solution: Try decreasing the brightness setting on the source decive to allow the signal to propagate throughout the system without any clipping or other signal degradation. Typically, brightness can be adjusted by opening the video card drivers on the source device/PC (e.g., from the Control Panel settings, select Intel GMA Driver) and in the Color Correction tab, adjust the brightness setting down. After adjusting the brightness of the source device, slightly readjust the gain on the RX Module until the image is clear and sharp.

APWeb Expansion Board

Applicability Notice

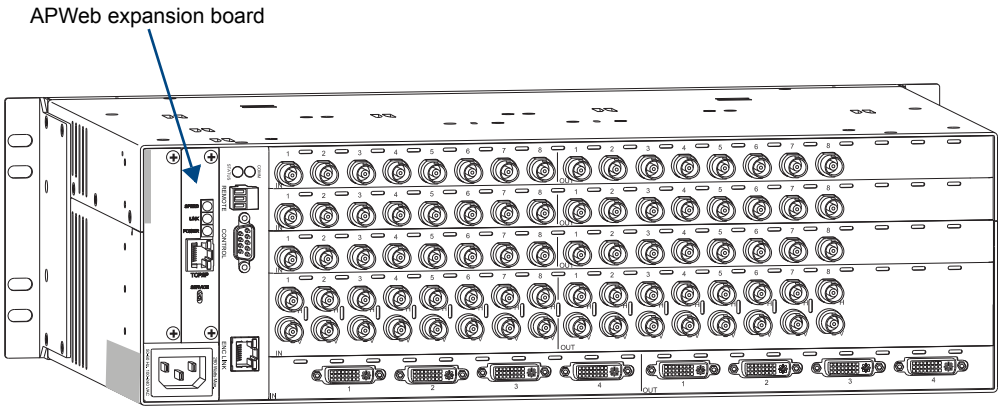


FIG. 67 APWeb expansion board

This chapter pertains to the Optima 3 RU APWeb expansion board, FG1046-313.

Overview

An APWeb board can be ordered pre-installed in an Optima 3 RU enclosure or as an upgrade for an existing 3 RU enclosure. (Not all Optima 3 RU enclosures support the APWeb expansion board; contact your AMX representative for details.) The APWeb board is located in one of the two expansion slots to the left of the CPU (FIG. 67). Multiple-enclosure systems that are configured to work as a single system require only one APWeb board.

The APWeb board connects to a LAN using an RJ-45 cable. Any PC-based Internet browsing software can then access the APWeb server. The APWeb server allows remote control and diagnostics of the system. It also offers a Telnet service that allows for direct BCS control via a standard terminal interface. For setup and operation details for the APWeb server, see the *Instruction Manual – APWeb Interface* on the *AMX AutoPatch CD* or at **www.amx.com**.

In addition, the APWeb board functions as a Tunneling Access Point (TAP). As a TAP, it can be used to configure the system with XNConnect (the communication setting in XNConnect *must* be changed; see the Help file) and can also be used to control a system using any software that supports XNNet protocol over TCP/IP (e.g., third party controllers).

The APWeb Expansion Board

The APWeb board has a TCP/IP Ethernet link connector, three indicator LEDs, and a Service switch.

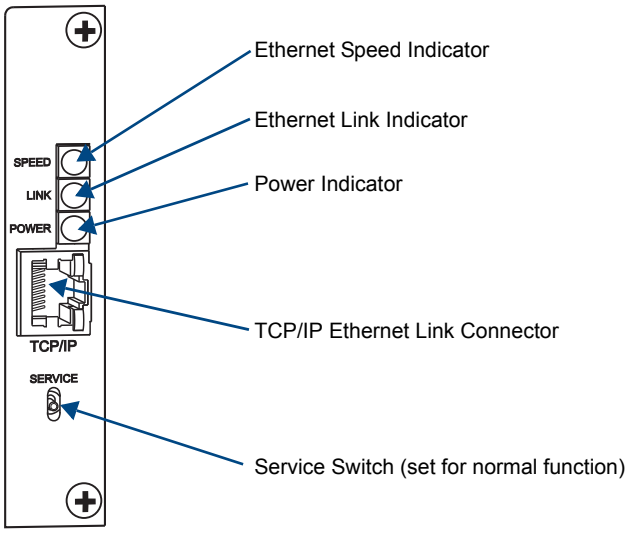


FIG. 68 The APWeb board

TCP/IP Ethernet Link Connector

The APWeb board has a TCP/IP Ethernet (RJ-45) link connector that handles Ethernet 10/100 connections for 10 Mbps (megabits per second) and 100 Mbps. This connection is compatible with most Ethernet based LANs.

Indicator LEDs

Above the TCP/IP connector are three green indicator LEDs, which indicate the following:

Ethernet Speed Indicator

- ❑ *On* – speed status is 100 Mbps
- ❑ *Off* – speed status is 10 Mbps

Ethernet Link Indicator

- ❑ *On* – link status is active

Power Indicator

- ❑ *On* – system is receiving power

Note: *The two small rectangular LEDs on the RJ-45 connector are not used on this product.*

Service Switch

Below the TCP/IP connector is a Service switch that can be used to override system security if the username and password are lost. The *Instruction Manual – APWeb Interface* includes instructions for restoring the default username and password.

The switch can also be used to upgrade the APWeb board firmware. Do *not* attempt to update the firmware unless directed to do so by technical support.

Caution: *For security purposes, firmware upgrades cannot be performed remotely.*

System Setup

The system setup example in FIG. 69 illustrates an Optima Distribution Matrix with an APWeb expansion board connected to a LAN. Both computers in the illustration have access to the Optima. If only one computer will be used, the APWeb board can be connected directly to the computer's network card.

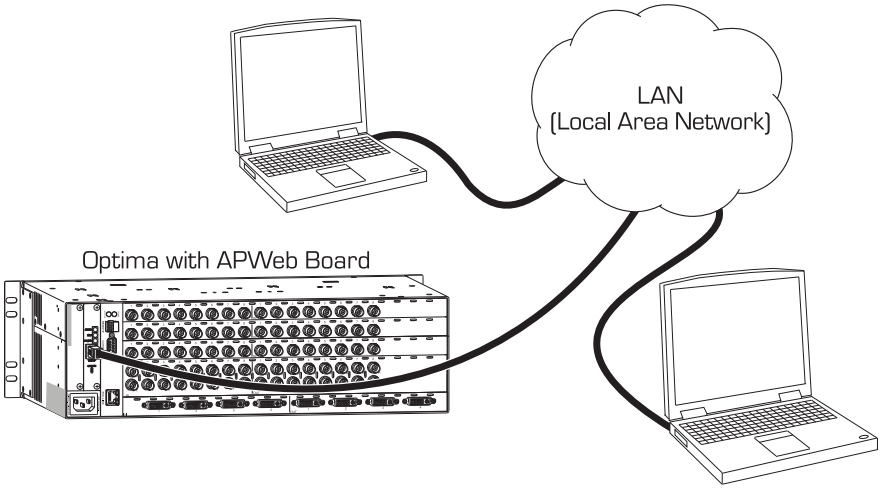


FIG. 69 Optima enclosure with APWeb board connected to a LAN

Important: *AMX AutoPatch systems should only be linked in their own isolated networks.*

Adding an APWeb Expansion Board

If the APWeb board has been pre-installed, go directly to the instructions on page 111 for cabling and applying power to the enclosure.

If the APWeb board was ordered to upgrade a system, complete the steps below and then follow the instructions on page 111 for cabling and applying power.

ESD Warning: *To avoid ESD (Electrostatic Discharge) damage to sensitive components, make sure you are properly grounded before touching any internal Optima materials. Use an ESD wristband and cord with an alligator clip attached to a good ground source.*

Note: *The APWeb board can be inserted into either of the expansion slots.*

To add an APWeb board to an enclosure:

1. Unplug the enclosure's power cord (in multiple-enclosure systems, turn off all power switches and unplug all enclosures).
2. Remove the screws holding the expansion plate.
3. Remove the expansion plate.
4. Insert the APWeb board into the empty expansion slot, aligning the board between the upper and lower guides inside the slot, pushing until the board is flush with the rear of the enclosure (FIG. 70).

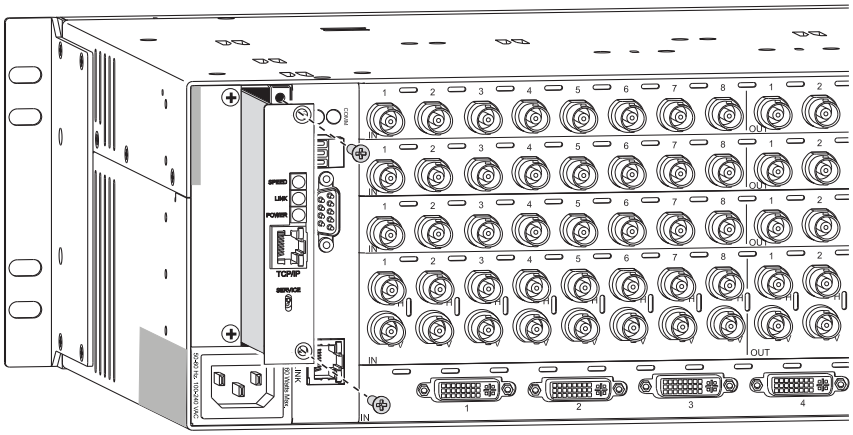


FIG. 70 Insert APWeb board into expansion slot and replace screws

5. Replace the screws.
6. For instructions on cabling and the power-up sequence, see page 111.

Cabling and Applying Power

After installing the APWeb board, connect it to a LAN or a Network Interface Card (NIC) on a PC. During the initial setup (see below), the APWeb board discovers the system. After the initial setup, it does not need to rediscover the system (even if power is cycled). If connecting to a PC, the PC's settings may need to be changed (contact your Network Administrator).

Communication Cable Requirements

- ❑ LAN Connection – Use an RJ-45 straight-through patch cable.
- ❑ PC Connection (NIC Card) – Use an RJ-45 crossover cable.

Connecting to a LAN or a PC

Important: *AMX AutoPatch systems should only be linked in their own isolated networks.*

To connect the APWeb board to the LAN or PC:

1. Complete the installation of the Optima enclosure(s) according to the installation procedure in the "Installation and Setup" chapter (see page 19). *Do not apply power until Step 4 below.*
2. Insert one end of the RJ-45 cable into an active LAN connection or a NIC on a PC.
3. Insert the other end of the cable into the TCP/IP (RJ-45) jack on the APWeb board (FIG. 71).

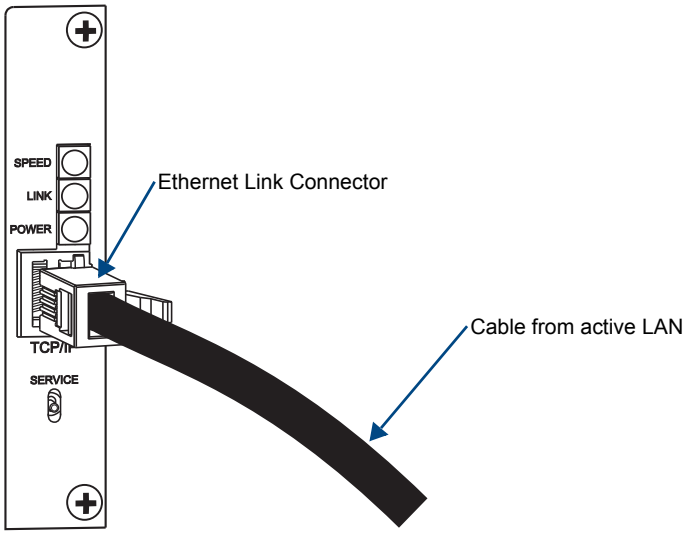


FIG. 71 Fasten Ethernet link connector

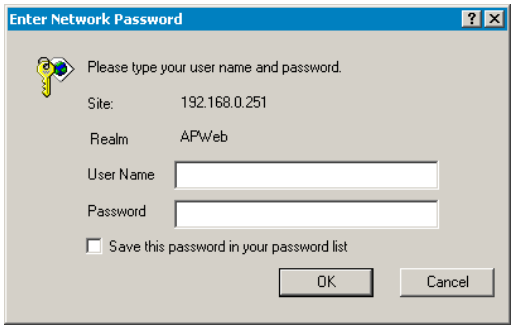
4. Apply power to the Optima enclosure(s). Apply power to the attached source and destination devices last.
5. Check the indicator LEDs (see page 108).
6. Allow 20 to 60 seconds for discovery, then test the connection (see page 112).

Testing the Connection

The connection between the APWeb board and the LAN should be tested to complete the setup. The instructions below open the APWeb site to the user's Home page, which has limited access to the APWeb server. If you need full access to configuration and security settings, see the *Instruction Manual – APWeb Interface*.

To test the connection:

1. Launch a browser on your computer.
2. Type http://192.168.0.251 (default address) in the address bar and press Enter.
   The Enter Network Password dialog box opens.
   If the dialog box does not open, see the Connection Troubleshooting section below and contact your network administrator.
3. Enter the case-sensitive default user name **none** and password **none**.



4. Click OK.
   APWeb opens.
5. For setup and operation details for the APWeb server, see the *Instruction Manual – APWeb Interface*.

Connection Troubleshooting

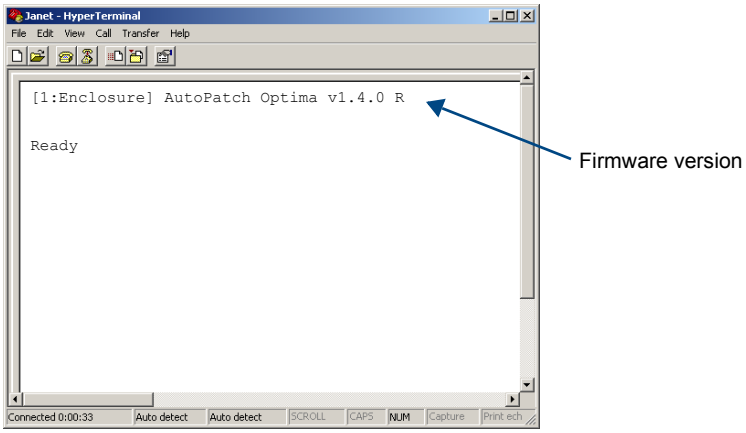
If the Enter Network Password dialog box does not open:

- ❑ Check all power, signal, and link connections; check to be sure the entire system is powered.
- ❑ Check the Power LED on the APWeb board (see page 108) to be sure it is illuminated.
- ❑ Check the cable type (see cable requirements on page 111). We recommend connecting the APWeb board directly to a PC for testing purposes.
- ❑ Ping the system. At the DOS prompt enter: `ping 192.168.0.251`
- ❑ Verify that the APWeb's IP address is included in the "Bypass Proxy Server" list in the Internet Options for the attached PC.
  If not, add the address in the Exceptions field in the Proxy Setting dialog box.
- ❑ Try connecting to the APWeb server again.
- ❑ If the problem persists, contact technical support (see page 38).

Troubleshooting strategies for other types of concerns can be found on the next two pages.

If APWeb opens but appears to be stalled (the message "Waiting to detect AutoPatch system on the network" displays for more than 30 seconds):

- ❑ Connect the PC directly to the serial port* on the Optima with a null modem cable.
- ❑ Open HyperTerminal (or other terminal emulation program).
- ❑ Power cycle the Optima; the splash screen appears with firmware version number.
- ❑ Verify that the firmware version is 1.2.0 or greater (see the graphic below).



- ❑ If the version reported is not 1.2.0 or greater (required for compatibility with an APWeb expansion board), contact technical support (see page 38) for a firmware upgrade.

* The serial port settings on the PC *must* be set at: baud rate – 9600, data bits – 8, stop bit – 1, parity – none, and flow control – none.

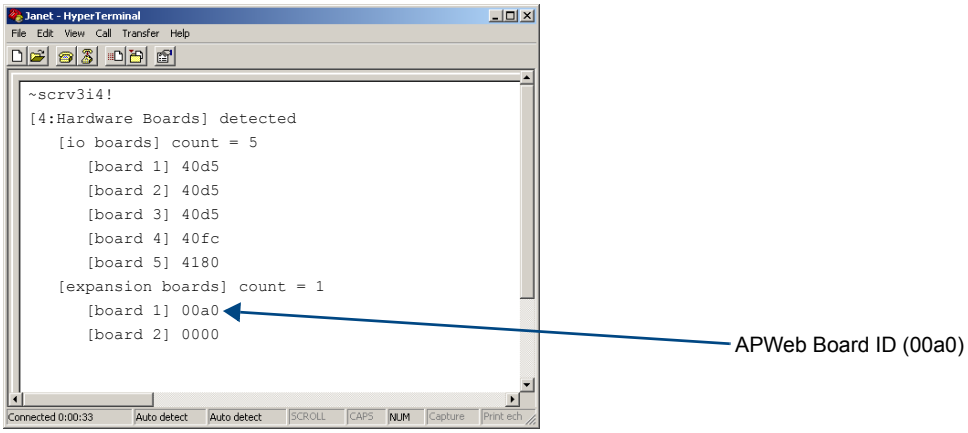
If the firmware version is compatible:

- ❑ Try reestablishing the connection.

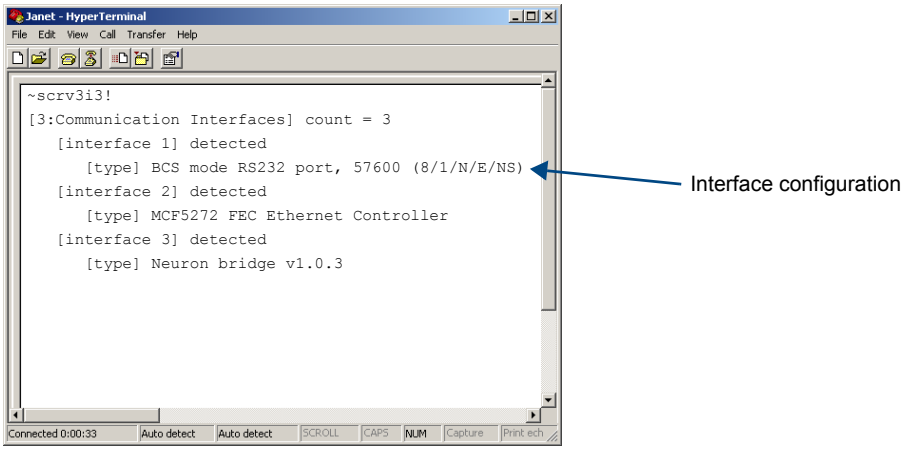
If the problem persists:

Verify and record the following information and contact technical support (see page 38).

- ❑ Enter the diagnostic command `~scrv3i4!`
  Verify that the board ID number for the APWeb expansion board is displayed under the `expansion boards` line. The ID number will be a combination of four digits and characters, e.g., `00a0` (`0000` indicates an empty expansion slot). The order that the ID number is listed indicates its position, e.g., listed first means it's next to the CPU board.



- ❑ Enter the diagnostic command `~scrv3i3!`
  Verify that one of the `[type]` lines displays the following configuration:
  `BCS mode RS232 port, 57600 (8/1/N/E/NS)`
  or
  `BCS mode RS232 port, 57600 (8/1/N/NE/NS)`



If APWeb opens, but the Home page displays a message that says, "There is no VM configuration information available":

- ❑ Log on APWeb using the Network Administrator's user name and password (found in the *Instruction Manual – APWeb Interface*).
- ❑ Click the Configuration link. Check to be sure that Force VM Discovery is turned *on*.
- ❑ If Force VM Discovery is not on, check it *on* and click the Reboot button.
- ❑ If the problem persists, contact technical support (see page 38).

XNNet Expansion Board

Applicability Notice

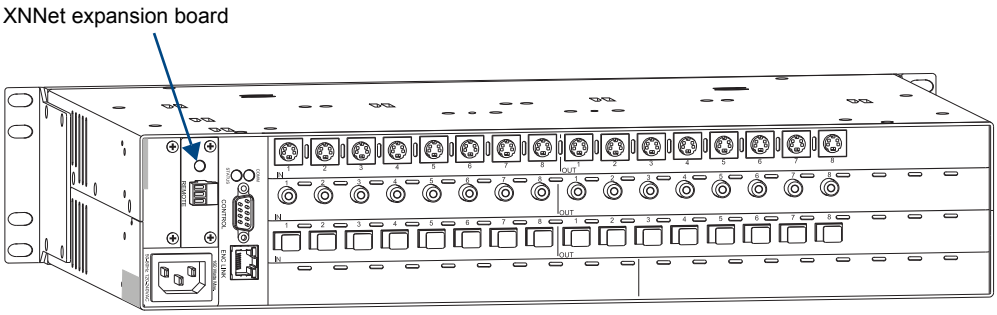


FIG. 72 XNNet expansion board

This chapter pertains to the Optima 2 RU XNNet expansion board, SA1046-310.

Overview

An XNNet expansion board is required to attach an external XNNet device to an Optima 2 RU enclosure.

An XNNet device is any device that sends and receives XNNet protocol over the Remote (XNNet) port. AMX AutoPatch XNNet control devices include remote control panels (e.g., the CP-15 and CP-20A). AMX AutoPatch XNNet accessory devices include Single Bus Controllers (SBCs) and Preset SBCs.

Note: *Optima 3 RU enclosures have a Remote port on the CPU.*

Board Ordered with System

If ordered with the system, the XNNet board is installed at the factory. For information on connecting a device to the XNNet board, see page 117.

Board Ordered as Upgrade to System

If the board is ordered as an upgrade for an existing system, it will need to be installed. For instructions on installing an expansion board, see page 116.

XNNet Device Ordered with System

If an XNNet device is included in the order, see the device's documentation for its installation information.

Adding an XNNet Expansion Board

If the XNNet board has been pre-installed, go directly to the instructions on page 117 for cabling the board and applying power to the system.

If the XNNet board was ordered separately as an upgrade to an existing system, complete the steps below and then see the instructions on page 117 for cabling the board and applying power to the system.

ESD Warning: *To avoid ESD (Electrostatic Discharge) damage to sensitive components, make sure you are properly grounded before touching any internal Optima materials. Use an ESD wristband and cord with an alligator clip attached to a good ground source.*

To add an XNNet board to an enclosure:

1. Unplug the enclosure's power cord (in multiple-enclosure systems, turn off all power switches and unplug all enclosures).
2. Remove the screws from one of the expansion plates; set the plate aside (FIG. 73).

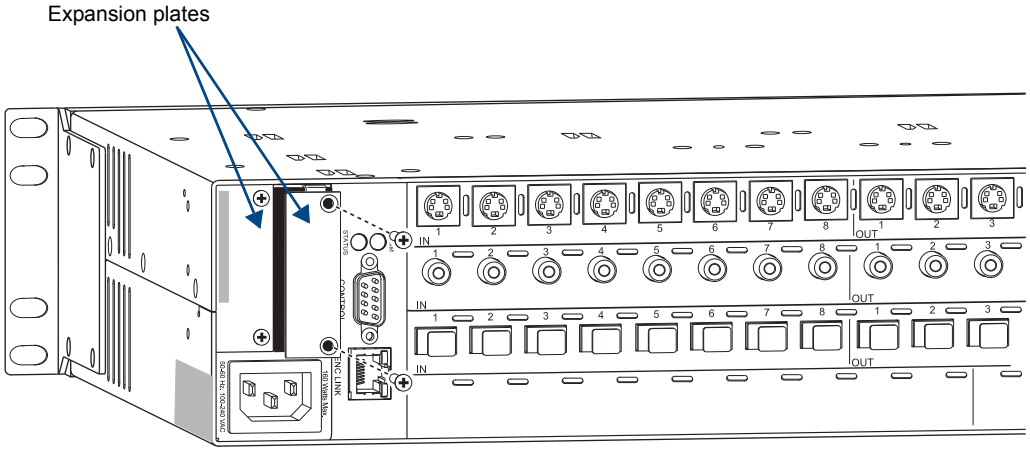


FIG. 73 Remove one of the expansion plates

3. Insert the XNNet board (the "Remote" label *must* be to the left; see FIG. 74) into the empty expansion slot, aligning the board between the upper and lower guides inside the slot. Press firmly until the board snaps into place.

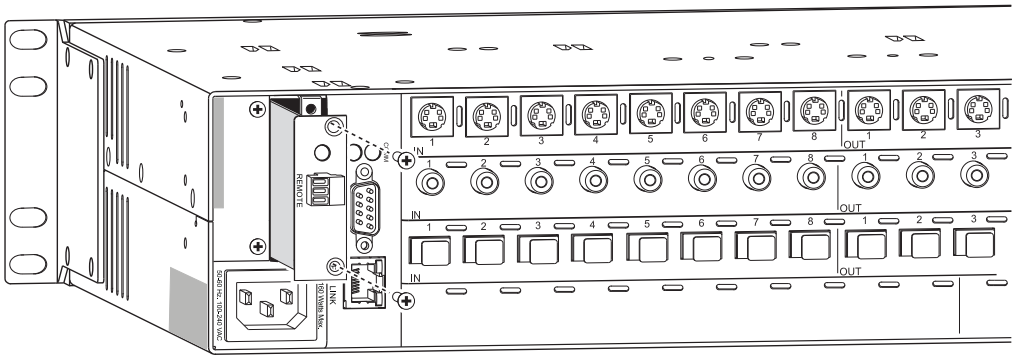


FIG. 74 Insert the XNNet board into expansion slot and replace screws

4. Insert the screws into the holes on the XNNet board, and tighten the screws until they are snug.
5. For cabling instructions, including the power up sequence, see page 117.

Attaching XNNet Devices

After the XNNet board is installed, it can be connected to an XNNet device that sends and receives XNNet protocol.

Communication Cable Requirements

- ❑ A two-conductor, 20 AWG, 7/28 strand cable with a drain wire or shield, such as Alpha 2412C (customer supplied)
- ❑ Maximum length of cable: 1,000 ft. (305 m)

To establish a Remote port connection with an XNNet device:

1. Complete the installation of the Optima enclosure(s) according to the installation procedure in the "Installation & Setup" chapter (see page 19). *Do not apply power until Step 7 below.*
2. Attach one end of the XNNet link cable to the corresponding port on the XNNet device (see the individual product documentation).
3. On the Optima's XNNet board, unplug the Remote (XNNet) connector.
4. Loosen the screws on the Remote connector.
5. Insert the two wires of the XNNet link cable from the device into the Remote connector leaving the center slot empty (FIG. 75).
   Note that either wire can be inserted into either of the outer slots.

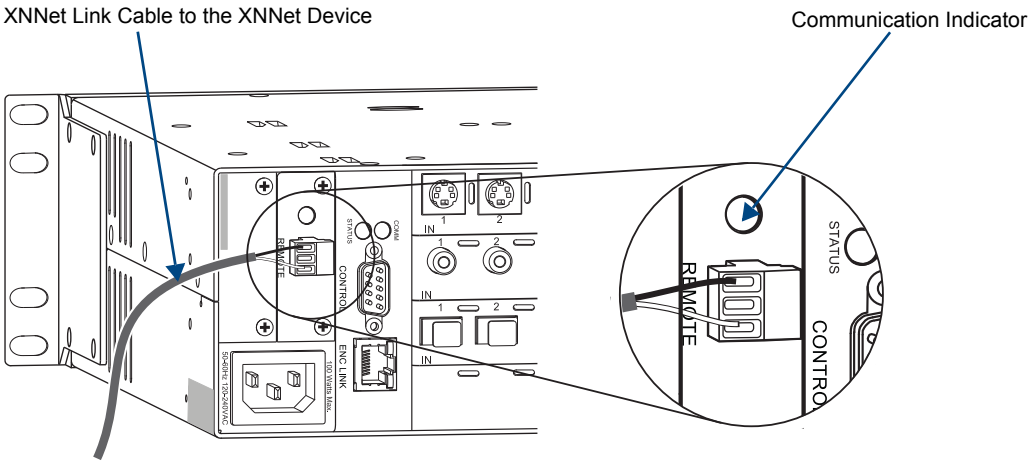


FIG. 75 Insert wires into the Remote connector on the board

6. Tighten both screws and plug the connector back into the XNNet board.
7. Apply power in the following order: Optima enclosure(s), XNNet device, and source and destination devices.
   The system is powered on, and the Communication Indicator LED above the XNNet connector illuminates (indicating traffic on the network).
8. See the XNNet device documentation to determine if the configuration file needs to be updated.

Appendix A – Managing Configuration Files

Applicability Notice

This appendix applies to XNConnect version 2.10.0. XNConnect's version information is located under its Help menu. Version 2.10.0 supports full Device Discovery through AMX's AutoPatch Duet module (firmware v1.4.0 or higher is required).

This appendix covers the following general information on using XNConnect configuration software and basic modifications for customizing the configuration:

- Installing XNConnect (see page 120)
- Discovering a system (see page 122)
- Opening an .xcl configuration file (see page 122)
- Navigating the interface (see page 123)
- Customizing channel names/labels (see page 125)
- Setting the control panel password for CP-15 control panels (see page 126)
- Creating local presets (see page 126)
- Loading an .xcl configuration file (see page 128)
- Device Discovery support (see page 129)

For information on advanced configuration modifications, see page 135 and the XNConnect Help file.

Overview

Caution: *Unless you need to reload the configuration file or modify your system's configuration from the original specifications, you will not need to use XNConnect. We recommend making a copy of the current file every time the file is modified.*

XNConnect can be used to modify a system's configuration information which contains routing and control information. XNConnect is provided on the *AMX AutoPatch CD* shipped with each system. Configuration file modifications include basic tasks, such as creating local presets, setting the control panel password (CP-15 Control Panels only), and customizing input and output channel names for control display (e.g., in the APWeb interface).

An Optima Distribution Matrix is configured either conventionally or automatically.

Conventional Configuration

An Optima system is conventionally configured when an .xcl configuration file (created in XNConnect) is downloaded to the CPU before shipment (applies to most Optima systems).

When a system is conventionally configured, the .xcl file can be accessed for modification in one of two ways. Either use XNConnect to discover the .xcl file on the CPU, or use XNConnect to open a copy of the .xcl file. The .xcl file copy is provided on the *AMX AutoPatch CD* (MyXCL folder) included in shipment. In either case, after the configuration is modified in XNConnect, it is loaded back onto the CPU (replacing the original .xcl file).

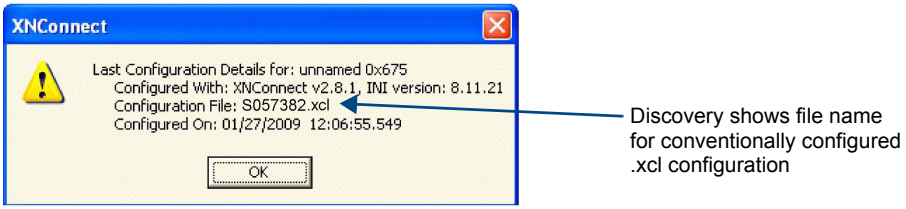

XNConnect
Last Configuration Details for: unnamed 0x675
Configured With: XNConnect v2.8.1, INI version: 8.11.21
Configuration File: S057382.xcl
Configured On: 01/27/2009 12:06:55.549
OK
Discovery shows file name for conventionally configured .xcl configuration

FIG. 76 Example of discovery information for conventionally configured .xcl file

Automatic Configuration

An Optima system is automatically configured when the system generates its own configuration based on the installed hardware (applies to some Optima single-enclosure systems). The configuration is constructed internally with a standard set of 3 virtual matrices* by the CPU upon initial boot up of the system.

When a system is automatically configured, the configuration information can be accessed for modification in only one way since an .xcl file does not exist for the system. Use XNConnect to discover the configuration information from the CPU. The discovered configuration information can then be saved as an .xcl file. After the configuration is modified in XNConnect, it is loaded back onto the CPU (replacing the automatically constructed configuration). If necessary, the automatically constructed configuration can be restored (see page 129).

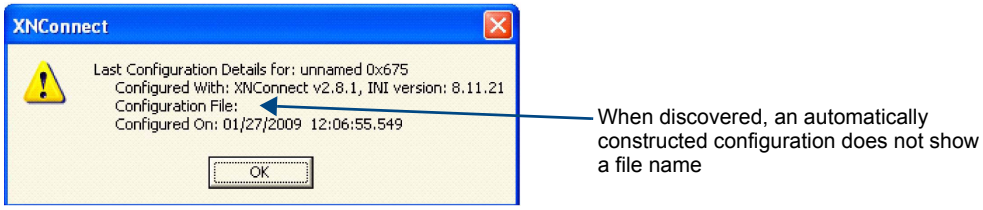

XNConnect
Last Configuration Details for: unnamed 0x675
Configured With: XNConnect v2.8.1, INI version: 8.11.21
Configuration File:
Configured On: 01/27/2009 12:06:55.549
OK
When discovered, an automatically constructed configuration does not show a file name

FIG. 77 Example of discovery information for automatically constructed configuration

* The standard set of 3 virtual matrices for switching signals is VM 0 = audio-follow-video, VM 1 = video, and VM 2 = audio.

AMX AutoPatch CD Information

If you cannot locate the *AMX AutoPatch CD* that shipped with your system and your AMX account has the required permissions, you can download the newest version of XNConnect from **www.amx.com**. An INI file Updater for updating XNConnect is available on the AMX website under Tech Center \ AutoPatch Tools; an account is not required. If you need an .xcl configuration file that is compatible with your system, either discover the system (see page 122) or contact technical support (see page 38) and provide your system's serial number.

Installing and Launching XNConnect

Use XNConnect software *only* if you need to customize or change the configuration information from the original specification.

Important: *Even if XNConnect is already on your PC, install the newest version that shipped on the "AMX AutoPatch CD" with your system. We strongly recommend uninstalling the old version of XNConnect before installing a new version.*

System Requirements

- Windows XP Professional®
- 233 MHz processor
- Minimum of 128 MB of RAM
- 20 MB of available hard drive space
- 800x600 screen resolution (1024x768 is recommended)
- Serial port and RS-232 null modem cable

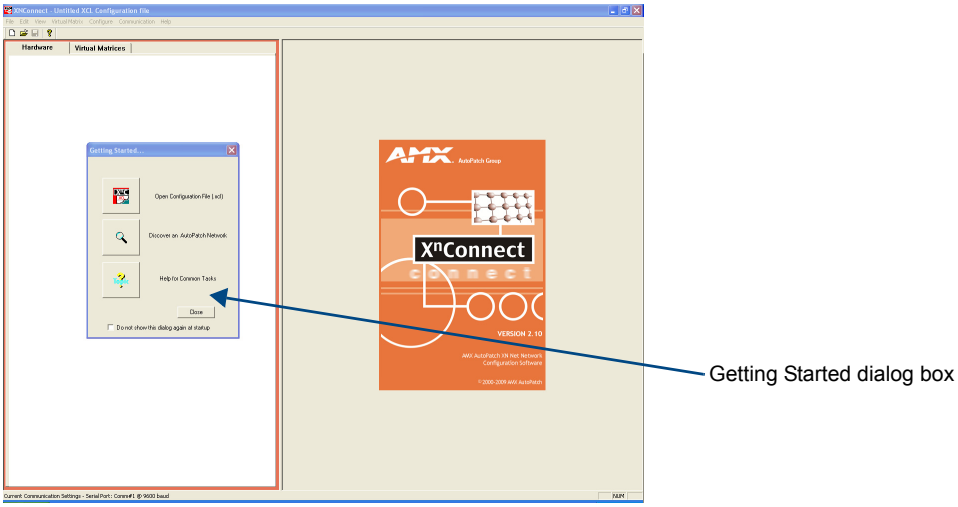
To install XNConnect from the AMX AutoPatch CD:

1. Close all other applications currently running on your PC.
2. Insert the *AMX AutoPatch CD* into your CD drive to start automatically.
   If the CD does not autorun, explore the CD folder and double-click the Index.html file.
3. Select Software and find XNConnect.
4. Optional – Select the Release Notes to read about the software before installation.
5. Select Install.
6. Follow the directions in the subsequent dialog boxes.

Note: *If your AMX account has the required permissions, the newest version of XNConnect can be downloaded from* ***www.amx.com****. An AutoPatch INI Updater file can also be found on the AMX website under Tech Center \ AutoPatch Tools for updating XNConnect with information for new support devices and I/O boards (an account is not required).*

To launch XNConnect:

1. From the Start menu, select Programs.
2. Select AutoPatch Applications (or other file group you specified during the installation).
3. Select the XNConnect folder.
4. Select XNConnect.
   The XNConnect program opens.



When XNConnect is open, two options are available for accessing the configuration:

- Discover the system (recommended). This works for both conventionally and automatically configured systems (see page 122).
- Open a copy of the .xcl file located in the MyXCL folder on the *AMX AutoPatch CD*. The .xcl file is only available on the CD if the system was conventionally configured (see page 122).

Discovering a System

The discovery process queries the attached system for configuration information and properties, including information regarding assigned signals and virtual matrix definitions. The discovery process may take several minutes to complete. We recommend disconnecting any third-party control devices from the enclosure's serial ports *before* starting the discovery process.

To discover a system:

1. Disconnect any third-party control devices from the enclosure's serial (Control) port.
2. Connect the enclosure to your PC (see page 29). (For systems with multiple enclosures, you can connect any of the enclosures to the PC as long as all of the enclosures are linked together.)
3. (If not already open) launch XNConnect (see page 120).
4. Open the Communication menu; select Serial Port.
5. If applicable – For a serial port other than COM 1 (default), open the Communication menu again; select Change Comm Settings. Check the settings for the selected port and adjust if necessary (the default is COM 1, baud rate 9600).
6. Optional – Click the Test button to verify that communication has been established with the enclosure. Click OK.
7. From the File menu, select Discover System (the discovery may take a few minutes).
8. From the File menu, select Save to save the discovered configuration information to the PC.
9. From the File menu, select Save As and save an .xcl file with a new name to the PC. (We recommend making a duplicate copy every time the file is modified.)

The discovered configuration is ready to be modified. Whenever changes are made, the new file *must* be loaded onto the system to implement the changes (see page 128).

Opening an .xcl Configuration File

The process of modifying an .xcl configuration file starts by opening it with XNConnect (or discovering system information; see above). After the modifications are complete, the new configuration information *must* be loaded onto the system to implement the changes.

Important: *Even if XNConnect is already on your PC, install the newest version that shipped on the same CD as the .xcl configuration file. We strongly recommend uninstalling the old version of XNConnect before installing a new version.*

Caution: *Use XNConnect only if you need to load or reload the .xcl configuration file or modify your system's configuration from the original specification. Make a copy of the original file every time the file is modified.*

To open an .xcl file:

1. Launch XNConnect (see page 121).
2. From the Getting Started dialog box, click Open Configuration File. (If the dialog box does not appear, from the File menu select Open.)
3. Use the standard Open dialog box to locate and open the .xcl configuration file. The default location is in the MyXCL folder on the *AMX AutoPatch CD*.
4. From the File menu, select Save As and save an .xcl file with a new name to the PC. (We *strongly* recommend making a duplicate copy every time the file is modified.)

The .xcl file is ready to be modified. Whenever changes are made, the new file *must* be loaded onto the system to implement the changes (see page 128.)

Navigating the Interface

XNConnect displays configuration information in two panes. The graphics are located in the left pane, and the properties of the currently selected graphic are in the right pane. At the top of the left pane are two tabs, Hardware and Virtual Matrices, for accessing the Hardware and Virtual Matrices views (see below). To see the details and components of a device or a virtual matrix, click the plus "+" symbol to the left of the device or the virtual matrix.

Most configuration file modifications involve entering information in a series of dialog boxes that are accessed by right-clicking a hardware device or virtual matrix icon and selecting an option from the shortcut menu. If you have a question regarding an open dialog box, press the F1 key for Help.

Hardware View

The Hardware view (FIG. 78) displays the system's hardware, such as enclosures and serial ports. This is the view used when setting the control panel password for CP-15 Control Panels (see page 126).

Virtual Matrices View

The Virtual Matrices view displays properties of the existing virtual matrices. Most common tasks are conducted from this view, including customizing channel names and creating local presets.

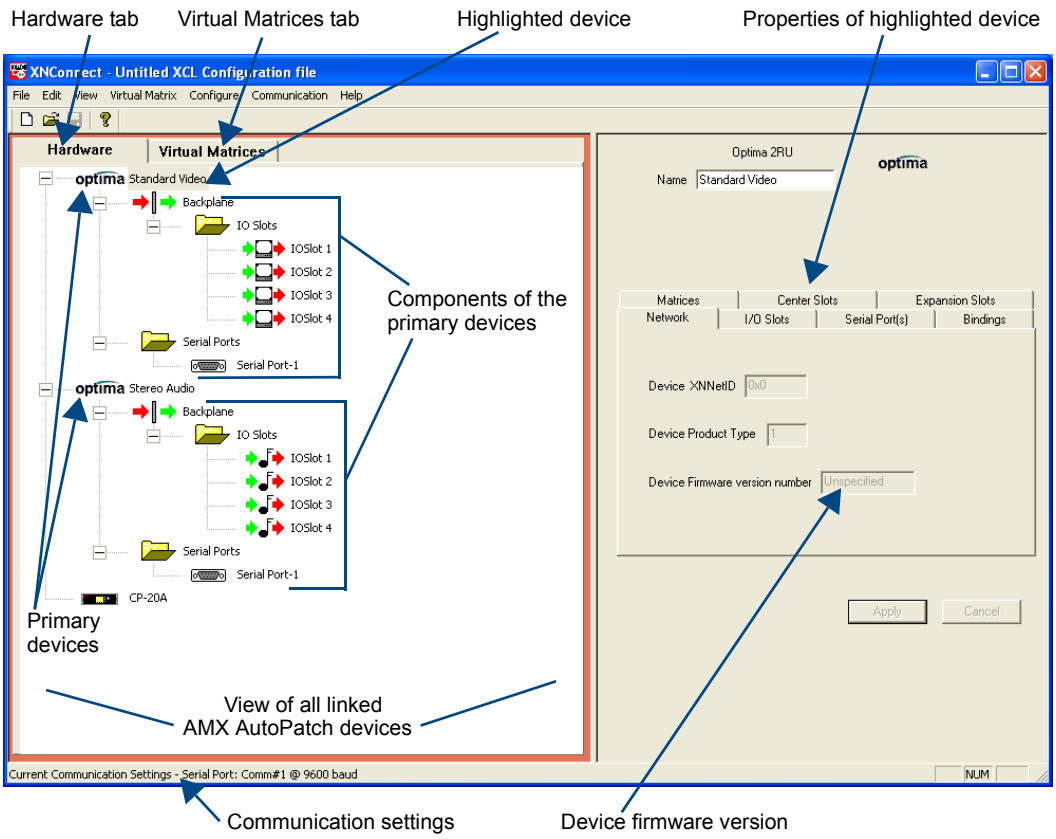


FIG. 78 XNConnect interface with Hardware tab selected

Multiple Signal Paths

In Optima systems, each matrix is a signal path. When you select a connector in the Virtual Matrices view, the properties box in the right pane indicates the signal and the signal path for the connector. If the signal has multiple signal paths (e.g., component signals), each of the signals will be displayed and each signal path will display an appended number. In the example shown (FIG. 79), the connector for input six contains two signal paths for an S-Video signal:

- S-VidV_IN_006.1 for the “Y” signal path
- S-VidV_IN_006.2 for the “c” signal path

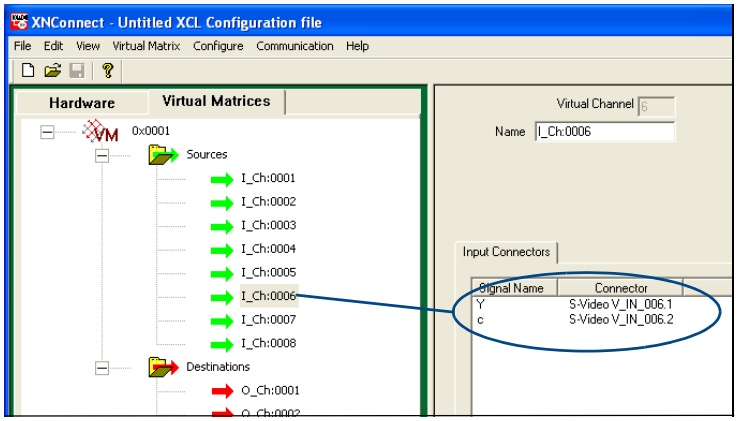


FIG. 79 Input connector properties showing two signal paths for one S-Video connector

Modifying an .xcl Configuration File

Modifying an .xcl configuration file with XNConnect involves entering information in a field or in a series of dialog boxes. A brief look at the contents in the Help file provides a quick overview of the possible modifications.

This section provides instructions for three common tasks: modifying channel names, setting the control panel password, and configuring local presets. For complete coverage of configuration related tasks, see the XNConnect Help file.

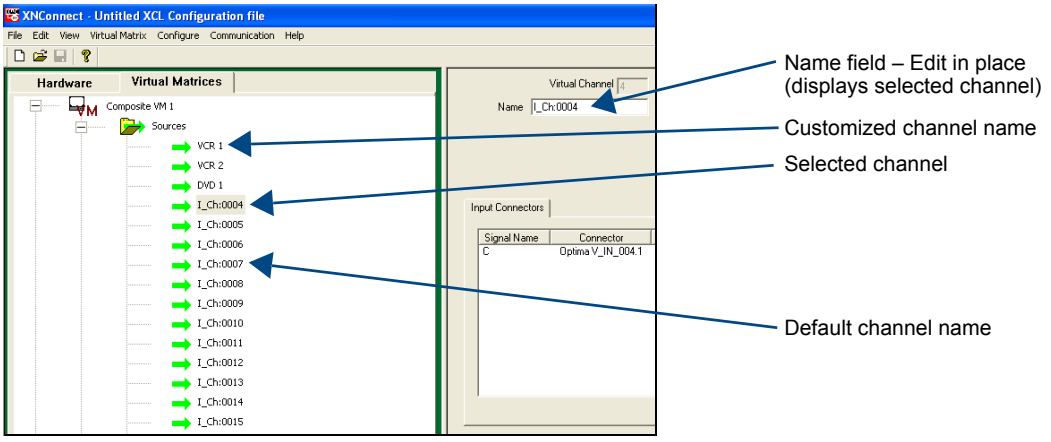
Modifying Source and Destination Channel Names

If the system is using APWeb for control, the names for the source and destination channels displayed in XBar can be customized in XNConnect. The custom names (labels) can be up to 23 characters and cannot contain the following characters: ‘ “ \ = ? < >

Note: *The CP-15 Control Panel can also displays custom names (LCD displays 20 characters only).*

To customize the channel names:

1. In the Virtual Matrices view, click the “+” to the left of the Virtual Matrix.
2. Click the “+” to the left of the Sources or Destinations folder.
3. Select the channel you want to rename.
4. Enter the new name in the Name field in the right-hand pane and press Enter.
   The new channel name replaces the default channel name in the Sources or Destinations list.



Note: *If a channel is in more than one VM (virtual matrix), you must repeat Steps 3 and 4 for the channel in each of the VMs.*

5. Customize additional channels by repeating Steps 3 and 4.
6. Load the .xcl configuration file onto the system (see page 128).
   If the .xcl configuration file has been previously loaded to the system and channel names are the only modifications that have been made to the file, select Configure \ Configure Special – Virtual Matrix \ Configure System Namespace.
   If the .xcl file is being loaded for the first time (assumes an automatically constructed configuration is on the CPU), select Configure \ Configure All.
7. From the File menu, select Save As and save an .xcl file with a new name to the PC.
   (We *strongly* recommend making a duplicate copy every time the file is modified.)

Caution: *The system must not be actively switching when loading this information onto the system.*

Setting the Control Panel Password

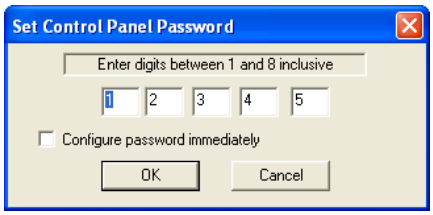
If the Optima has a CP-15 Control Panel, the panel can be locked and unlocked (see the *Instruction Manual – CP-15 Control Panel*, available on the *AMX AutoPatch CD* or at **www.amx.com**). Locking the panel prohibits access to the system and can prevent accidental switching. The password can be set either with the control panel (see the *Instruction Manual – CP-15 Control Panel*) or with XNConnect (see below). If a password has been created and downloaded to the system from XNConnect, a new password can be set from the control panel to replace it; however, the previous one *must* be entered first. If a password is set with the control panel, a new password can be set and downloaded to the system using XN Connect.

The password consists of five digits between 1 and 8 that are entered on the control panel using a combination of five of the first eight Input Keys (keys can be used multiple times).

The system connected to the PC *must* be powered up before the password can be loaded to the control panel. If not already connected, complete the first five steps of the instructions for "Discovering a System" on page 122.

To set the password and load it to the control panel:

1. Discover the system (see page 122) or open the .xcl file (see page 122).
2. In the Hardware view, right-click the CP-15 control panel icon.
   (If the control panel icon is not displayed, double-click the Optima icon.)
3. Select Set Password from the drop-down menu.
   The Set Control Password dialog box opens.



4. Enter a single digit between one and eight (inclusive) in each field.
5. Check the box for Configure Password Immediately.

Important: *If you use the Configure menu instead of checking the box, the only configuration option that will load password information is Configure \ Configure Special - Hardware \ Configure All Passwords.*

6. Click OK.
   The updated password information is immediately loaded to the control panel, and the new password sequence *must* be used to lock and unlock the control panel.
7. From the File menu, select Save As and save an .xcl file with a new name to the PC.
   (We *strongly* recommend making a duplicate copy every time the file is modified.)

Creating Local Presets

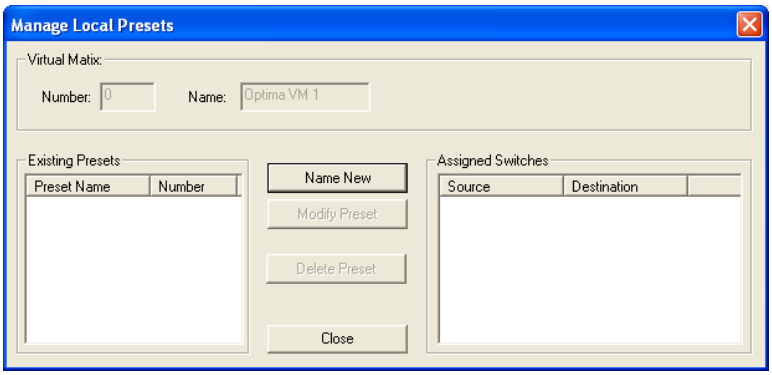
A local preset is a predetermined collection of switches on the same virtual matrix to be routed simultaneously. Executing a local preset affects only those inputs and outputs specified, not the whole system. Local presets are defined using XNConnect and can be executed using a control panel (local or remote) or using BCS commands as part of a macro in APControl 3.0 or APWeb or entered in a terminal emulation program. The process for creating local presets involves three dialog boxes that cover managing, naming, and modifying presets.

The Optima supports a maximum of 16 local presets.

The instructions following are for creating a local preset. For detailed information on modifying and deleting local presets, see the XNConnect Help file.

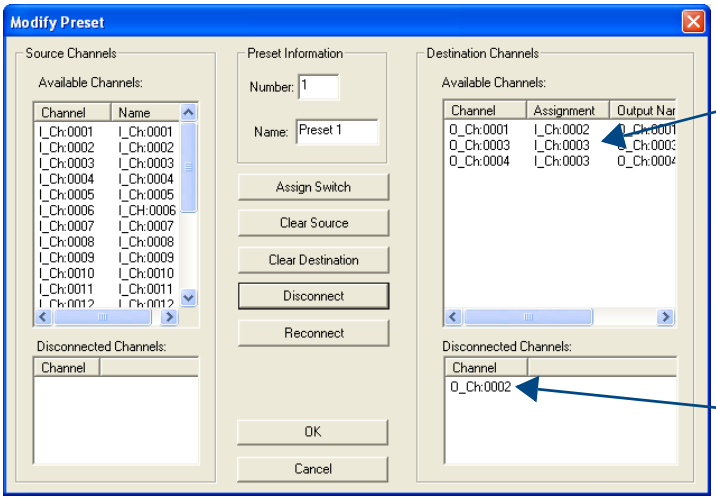
To create a new local preset:

1. In the Virtual Matrices view, right-click the virtual matrix the preset will be created for and select Manage Local Presets from the shortcut menu.
   The Manage Local Presets dialog box opens.



2. Click the Name New button.
   The Name New Preset dialog box opens.

3. Optional – Enter a different preset number (local presets do not need to be numbered sequentially).
4. Enter a name for the new preset.
5. Click OK.
   The Modify Preset dialog box opens.
6. For the first switch, click the source channel (input) and one or more destination channels (outputs). Select multiple destination channels by holding down the Control key while selecting the channels.



The Assignment column shows three switches that will be executed as part of Preset 1:

Input 2 to Output 1

Input 3 to Output 3 and Output 4

The Disconnected Channels box shows that Output 2 will be disconnected as part of Preset 1.

7. Click the Assign Switch button.
   The input appears in the Assignment column of the Destination Channels list; the switch will execute when the local preset is executed.
8. Disconnect inputs* or outputs as part of the local preset by selecting either the source or destination channel and clicking the Disconnect button.
   The input or output appears in its corresponding Disconnected Channels list; the input or output will be disconnected when the local preset is executed.
   * Disconnecting an input will disconnect *all* outputs it is connected to.
9. Repeat Steps 6, 7, and 8 for all switches and/or disconnects to be included in the preset.

Note: *For information on the other buttons and preset modifications, press F1 while the Manage Local Presets dialog box is open.*

10. After all switches for the preset have been assigned, click OK and then close the Modify Local Presets dialog box.
11. Define additional local presets by repeating the steps.

Caution: *The system must not be actively switching when loading this information onto the system.*

12. Load the .xcl configuration file onto the system (see below).
    If the .xcl configuration file has been previously loaded to the system and local presets are the only modifications that have been made to the .xcl file, select Configure \ Configure Special – Virtual Matrix \ Configure All VM Local Presets.
    If the .xcl file is being loaded for the first time (assumes an automatically constructed configuration is on the CPU), select Configure \ Configure All.
13. From the File menu, select Save As and save an .xcl file with a new name to the PC.
    (We *strongly* recommend making a duplicate copy every time the file is modified.)
14. If applicable – Reload the .xcl file from the CPU to the control panel according to the directions in the *Instruction Manual* for the control panel.

Loading an .xcl Configuration File

Once modifications have been made to the configuration file, the new file *must* be loaded onto the system's CPU for the changes to be implemented.

There are two basic options for loading an .xcl configuration file:

- Load the entire file using the "Configure All" option (see Caution below).
- Load part of the file using one of the "Configure Special" options.

To determine which configuration option to use, see "Configure Menu Commands" in the Help file.

When loading any part of a configuration file, the matrix switcher *must not* be actively switching. You may want to disconnect any external controllers to ensure that no switches are executed during the loading of the file. If applicable, you may also want to lock the control panel (see the *Instruction Manual* for the control panel).

Caution: *Using the "Configure All" option will erase any global presets (see the "Instruction Manual – BCS Basic Control Structure Protocol" on the "AMX AutoPatch CD" or at **www.amx.com**) that have already been defined for the system.*

To load an .xcl configuration file to the enclosure's CPU:

Important: *The matrix switcher must not be actively switching when loading any part of or all of the .xcl configuration file.*

1. Recommended – Lock the control panel and/or disconnect any external controllers to ensure that no switches are executed during the loading of the file. If you have not already done so – From the File menu, select Save As and save an .xcl file with a new name to the PC. (We *strongly* recommend making a duplicate copy every time the file is modified.)
2. Connect the Optima enclosure to the PC (see page 29). (For systems with multiple enclosures, you can connect any of the enclosures to the PC as long as all of the enclosures are linked together.)
3. In XNConnect, open the Communication menu and select Serial Port.
4. Open the Communication menu again; select Change Comm Settings.
5. Check the settings for the selected port and adjust if necessary (the default is COM 1 with a baud rate of 9600).
6. Optional – Click the Test button to verify that communication has been established with the Optima. Click OK.
7. From the Configure menu, select the appropriate configuration option. For an explanation of Configuration menu options, see the Help file. (The Configure All option will not load password information. For instructions on loading password information, see page 126.)

The system automatically reboots (applies to non-hardware configuration options only; for hardware, select the appropriate configuration option and then Configure > Reboot All Devices).

Important: *If the configuration file was loaded to the CPU because local presets were created, it may need to be reloaded from the CPU to the control panel (see the "Instruction Manual" for the control panel).*

Restoring the Automatic Configuration

Caution: *Restoring the automatically constructed configuration will result in the loss of all custom .xcl configuration file modifications (local presets, passwords, etc.).*

To restore the automatically constructed configuration:

1. Connect the system to a PC (see page 29).
2. Open a terminal emulation program (e.g., HyperTerminal).
3. Enter: `~def!` to restore the configuration.
4. Wait for a "V" to be returned (may take several seconds).

Device Discovery Support

XNConnect v2.10.0 supports Device Discovery (firmware v1.4.0 or higher is required). Typically the default configuration string generated by XNConnect is all that is necessary. However, certain conditions may warrant a custom string, such as the need to limit the VMs that are available for control by the AMX control system. Or a need may exist to limit the features available for a system, e.g., omitting the ability to adjust input gain, but leaving support for output volume. To customize the configuration string, see the XNConnect Help file topic "Device Discovery Config String Input."

Appendix B – Programmer's Interface for System Diagnostics

System Component Information

The Optima displays system information in its splash screen* for diagnostic purposes. The information indicates the current status and well-being of the system components.

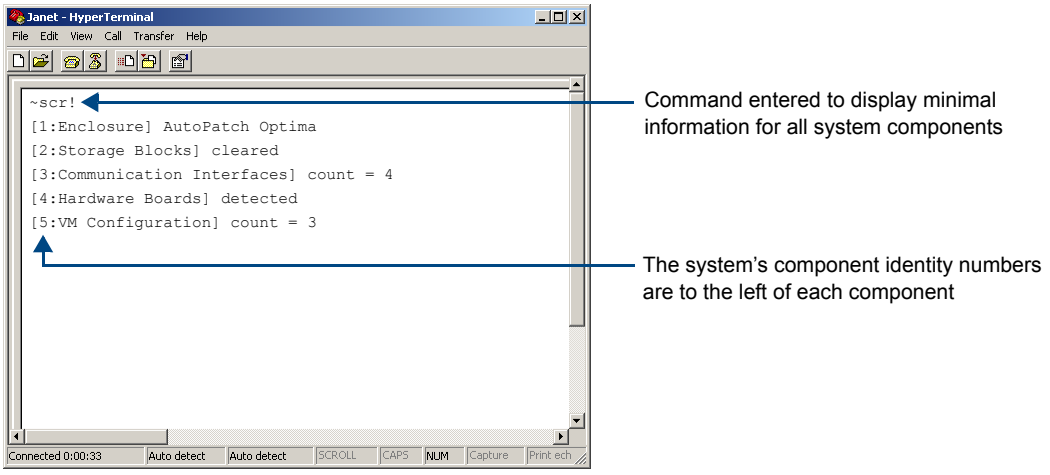


FIG. 80 Example of an Optima splash screen

The splash screen can be accessed using a terminal emulation program, such as HyperTerminal (see page 35). One of four verbosity** settings is specified, which provides either a list of the five system components with minimal information (FIG. 80) or a level of detailed information on one of the five components. Only one verbosity setting and one component setting can be entered in a command. The order in which the verbosity and component settings are entered is interchangeable.

Note: *In a multiple-enclosure system, the splash screen displays information only for the enclosure that is connected directly to the PC.*

* AMX reserves the right to add to the contents of the splash screen at any time, without notice.

** Verbosity (i.e., wordiness) refers to the amount of information provided; the higher the verbosity setting, the more information is displayed.

Verbosity Settings

The verbosity (`v`) settings (`v0`, `v1`, `v2`, `v3`) correspond to the level of detail that will be displayed, with `v0` being the lowest level of detail and `v3` being the highest level.

Component Identity Settings

Detailed information for a single system component can be specified by using its identity (`i`) number setting (`i0` through `i5`) in the following table. Minimal information for all five components can be specified by using the identity number `i0`.

Component	Identity Number
All Components	`i0`
Enclosure	`i1`
Storage Blocks	`i2`
Communication Interfaces	`i3`
Hardware / Boards	`i4`
VM Configuration	`i5`

Default Settings

- At system boot, the `~scrv0i1!` setting is displayed (FIG. 18 on page 35).
- If the verbosity setting is omitted, the verbosity level will be the lowest (`v0`).
- The component setting *must* be included; otherwise, entering any of the verbosity settings alone will result in a display equivalent to `v0i0`.
- If both settings are omitted during a query (`~scr!`), the information displayed will be at the lowest verbosity level for all components (`v0i0`) (FIG. 80 on page 131).

Using BCS to Access System Diagnostic Information

Instructions are provided for accessing the lowest level of verbosity for all components and for accessing a specific level of verbosity for a specific component.

To access the lowest level of verbosity for all components:

1. Enter `~scr!` or `~scrv0i0!`

Note: *Either of these commands provides a "menu" of the identity numbers and their corresponding components (FIG. 80 on page 131).*

Only one verbosity setting and one component setting can be entered in a command. The order in which the verbosity and component identity settings are entered is interchangeable.

To access a specific level of verbosity for a specific component:

1. Enter `~scr` (to access the splash screen).
2. Enter the verbosity level setting `v#` and the component's identity setting `i#`.
   Either may be specified first.
3. Enter `!` (to send the command).

Example

`~scrv3i5!` or `~scri5v3!` (Either displays the highest level of detail for the VM Configuration.)

Splash Screen Examples

Following are four examples of splash screen information that could be displayed when different verbosity/component settings are specified. Depending on the amount of detail provided, you may need to scroll to see the entire display. Use the first example to check the host software (IOS) version and the hardware driver (appcode) version.

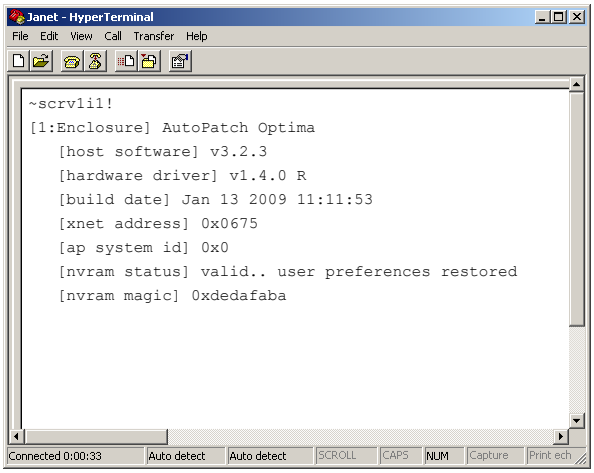


FIG. 81 Display for v1i1 (verbosity 1, component 1)

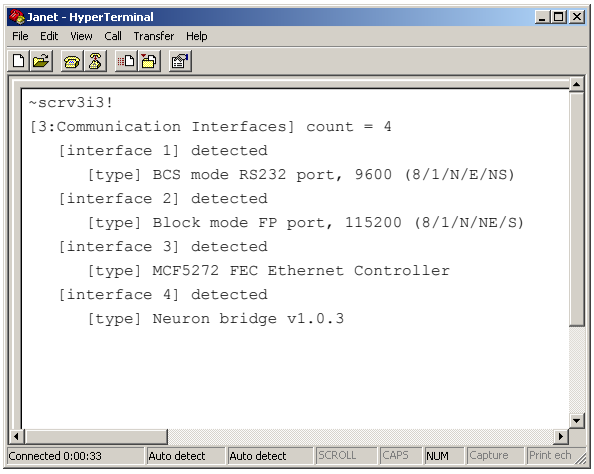


FIG. 82 Display for v3i3 (verbosity 3, component 3)

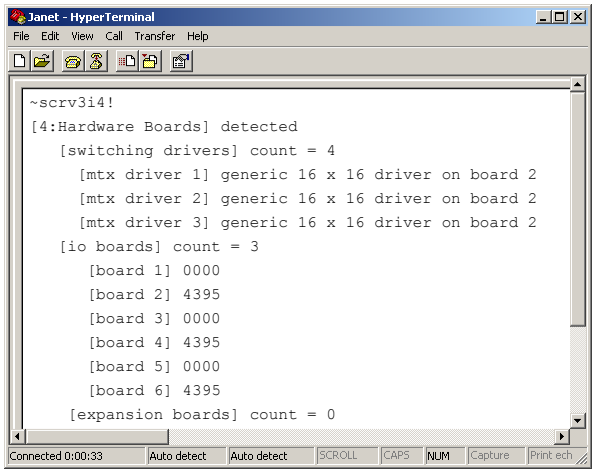


FIG. 83 Display for v3i4 (verbosity 3, component 4)

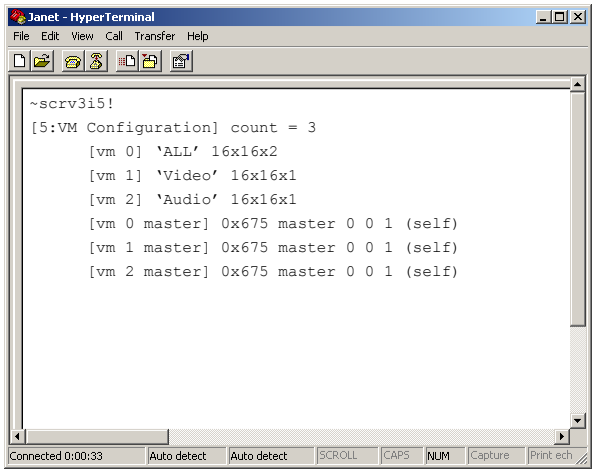


FIG. 84 Display for v3i5 (verbosity 3, component 5)

Appendix C – Advanced Configuration: Modifying Virtual Matrices

Applicability Notice: This appendix applies to XNConnect version 2.10.0. XNConnect's version information is found under its Help menu. Version 2.10.0 supports full Device Discovery through AMX's AutoPatch Duet module (firmware v1.4.0 or higher is required).

Overview

Your AMX AutoPatch Distribution Matrix is pre-engineered at the factory. It is ready to switch once the source and destination devices are attached. The configuration file does *not* need any advanced modification unless you change the hardware or want to change or add virtual matrices. Any new equipment for upgrading an existing system will be shipped from the factory along with a new configuration file to be loaded onto the system. *We strongly recommend using the new file instead of attempting to modify the existing configuration file to accommodate the new equipment.*

Important: *If any modifications are made to the configuration file other than customizing channel names, creating local presets, or changing control panel passwords, provide technical support with a copy of the modified .xcl file for future support.*

If your configuration file needs any type of additional advanced modification, we *strongly recommend* contacting technical support (see page 38) to request a modified .xcl file or ask for assistance.

Caution: *Virtual matrix modifications are an advanced feature of XNConnect that should not be attempted unless you are extremely familiar with XNConnect and the AMX AutoPatch Distribution Matrix being configured.*

This appendix covers three advanced virtual matrix related tasks:

- Joining (combining) virtual matrices
- Creating breakaway virtual matrices
- Creating a new virtual matrix

Important: *Save a back up copy of the existing configuration file if you find it necessary to modify the file for any reason.*

Virtual Channels and Virtual Matrices

A system's configuration allows groups of incoming signals from source devices to be routed through the system and out to destination devices. The signals are grouped into virtual input and output channels in which the channels' component signals (such as R, G, B, H, and V) can be grouped into a single channel to permit the simultaneous switching of them as an aggregate signal (RGBHV). The resulting virtual channel uses a single input or output number for control purposes.

A virtual channel is assigned to a physical connector or group of physical connectors. The signals in the virtual channels will be switched in unison (e.g., a Y signal and a c signal on a Y/c board are each assigned to a different connector but are switched in unison). A virtual channel can also be a subset of a signal on a single connector (e.g., the left channel of a stereo audio connector).

The virtual input and output channels are then grouped into virtual matrices (VMs) that define where the virtual channels can be routed. A virtual channel on one VM cannot be routed to a virtual channel on another VM. However, a VM can be created that includes multiple VMs. Normally the virtual channels are assigned to a VM in a pattern (see page 143), but they can be assigned individually (see the XNConnect Help file).

Joining Virtual Matrices

Existing virtual matrices can be joined, allowing the signals of the combined VMs to be switched simultaneously. The most common reason for joining VMs is to configure a system so that audio can follow video. VMs that contain the same signal cannot be joined, e.g., two matrices cannot be joined if they both contain S-Video signals.

If one of the VMs to be joined is smaller than the other, the combined VM will only include the number of channels in the smaller VM. For example, if VM 1 is 8x8 and VM 2 is 16x16, the combined VM will include all of the channels of VM 1 and the first 8 input and 8 output channels of VM 2.

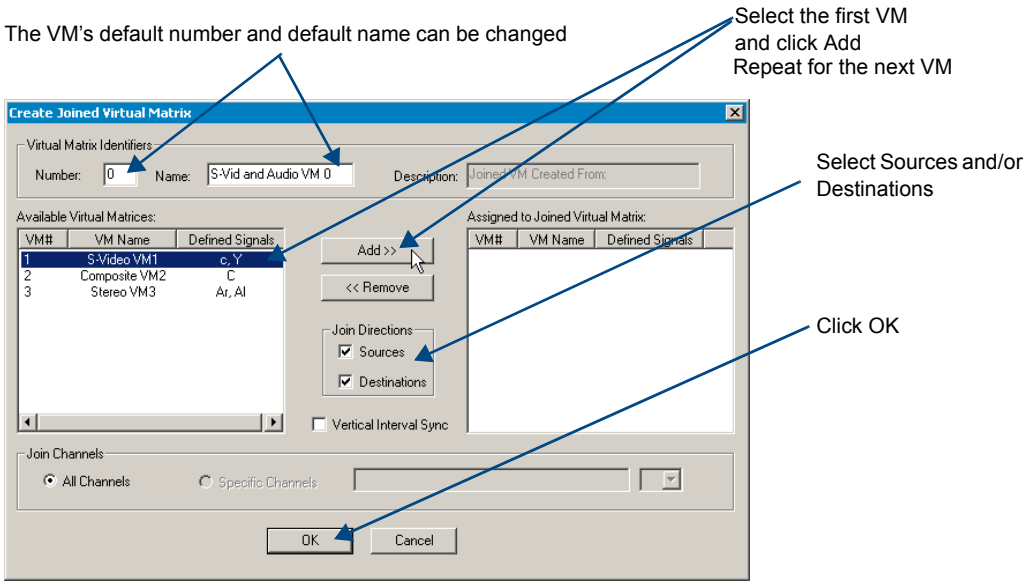
Joining a specific subset of channels is not supported at this time. For the same result, join two VMs, delete the unwanted channels from the joined VM, and then collapse the channel gaps (see the XNConnect Help file).

The information in the dialog box below is based on the following scenario. The original system switches 16x16 S-Video on VM 1 and 20x20 stereo audio on VM 3. The two VMs are joined to create VM 0 that switches input and output signals for sixteen pairs of video and audio signals.

Note: *For additional information on joining virtual matrices, see the XNConnect Help file. To access the Help file topic for an open dialog box, press F1.*

To create a joined virtual matrix:

1. From the Virtual Matrix menu, select Join Virtual Matrices.
2. Select the first VM to be joined and click Add.
3. Select the second VM to be joined and click Add.
   Repeat for any additional VMs.



4. Optional – Under Virtual Matrix Identifiers, change the number and name.
5. Check the Sources and Destinations check boxes so that both are joined in the new VM.
   Click OK.
6. Load the configuration file onto the system; see page 128.
7. Using Save As (under the File menu), make a duplicate copy of the modified file with a new name and save it to the PC. (We *strongly* recommend making a duplicate copy every time the file is modified.)

Caution: *The system must not be actively switching when loading this information onto the system.*

Creating Virtual Matrix Breakaways

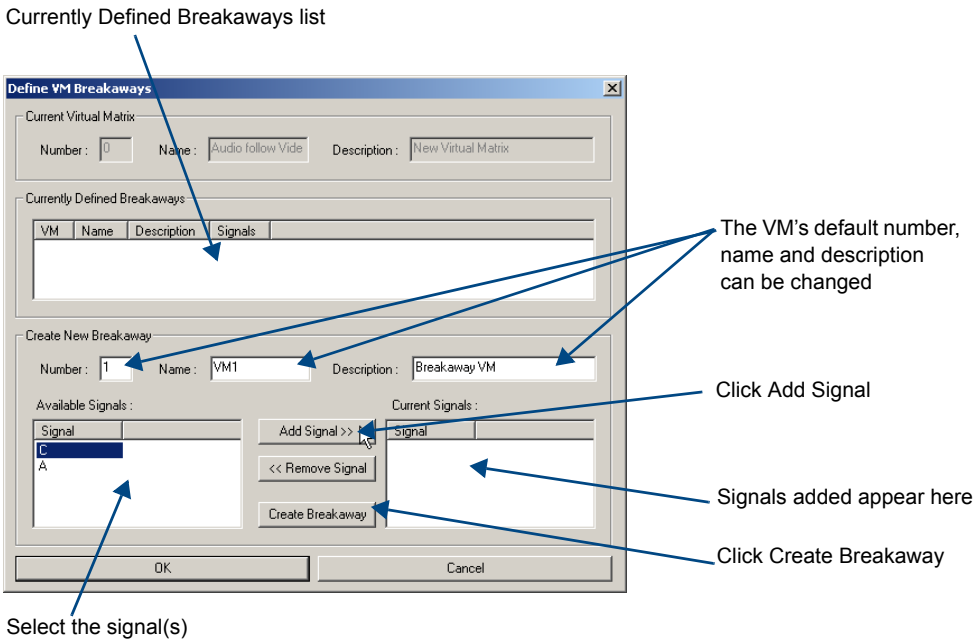
Breakaway virtual matrices can be created from an existing virtual matrix, allowing signals to be switched independently. The most common reason for creating virtual matrix breakaways is to configure a system so that video and audio signals can be switched separately.

The information in the dialog boxes for this section is based on the following scenario. The original system was configured to switch RGBHV and stereo signals together on Virtual Matrix 0, and now they need to be switched independently. Two additional virtual matrices, VM 1 (for RGBHV) and VM 2 (for stereo audio), are created to allow the video and audio to switch independently (breakaway).

Note: *For additional information on creating breakaways, see the XNConnect Help file. To access the Help file topic for an open dialog box, press the F1 key.*

To create the first breakaway:

1. Right click the VM that the breakaways will be created from.
2. From the shortcut menu, select Define VM Breakaways.
   The Define VM Breakaways dialog box appears.
3. Optional – Under the Create New Breakaway section, change the number, name, and description.
4. From the Available Signals list, select the signal(s) to be included (to select multiple signals, hold down the Control key), and click Add Signal.
   The signals appear in the Current Signals list.



5. Click Create Breakaway. Do *not* close the dialog box.
   The VM appears in the Currently Defined Breakaways list.

To create the second breakaway:

6. Optional – Under the Create New Breakaway section, change the number, name, and description.
7. From the Available Signals list, select the signal(s) to be included (to select multiple signals, hold down the Control key), and click Add Signal.
   The signals appear in the Current Signals list.
8. Click Create Breakaway.
   The VM appears in the Currently Defined Breakaways list.
9. Click OK to finalize the assignments.
10. Load the configuration file onto the system; see page 128.
11. Using Save As (under the File menu), make a duplicate copy of the modified file with a new name and save it to the PC. (We *strongly* recommend making a duplicate copy every time the file is modified.)

Caution: *The system must not be actively switching when loading this information onto the system.*

Creating a New Virtual Matrix

Important: *Save a backup copy of the existing configuration file if you find it necessary to modify the file for any reason.*

A new virtual matrix can be created for new or existing hardware in a system. Rather than making changes to an existing virtual matrix, you can create a new one that uses the same board(s). When creating a VM to replace an existing one, delete the old VM or (if reuse is likely) change its number. *Always exercise caution and make a backup copy before deleting any part of the existing file.*

Optional – To delete an existing VM:

1. Using Save As (under the File menu), make a backup copy of the current file with a new name and save it to the PC.
2. Right click the VM and select Delete.

Process Overview

Creating a new virtual matrix involves creating virtual channels which *must* be assigned to the physical connectors and grouped into a virtual matrix. For more information on virtual matrices, see page 135. Four dialog boxes are used for creating a virtual matrix. The first is for assigning the signals to the VM; the second for assigning the signals to the physical matrix; the third for selecting the connector assignment method; and the fourth for completing the connector assignments. To access the Help file regarding an open dialog box, press F1.

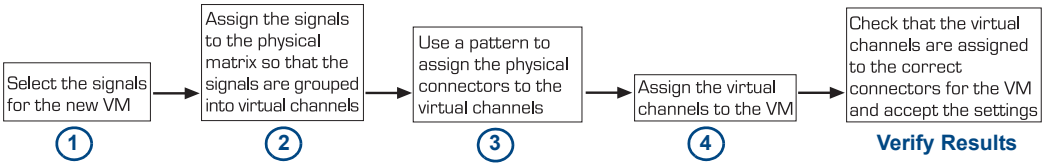

Select the signals for the new VM
1
Assign the signals to the physical matrix so that the signals are grouped into virtual channels
2
Use a pattern to assign the physical connectors to the virtual channels
3
Assign the virtual channels to the VM
4
Check that the virtual channels are assigned to the correct connectors for the VM and accept the settings
Verify Results

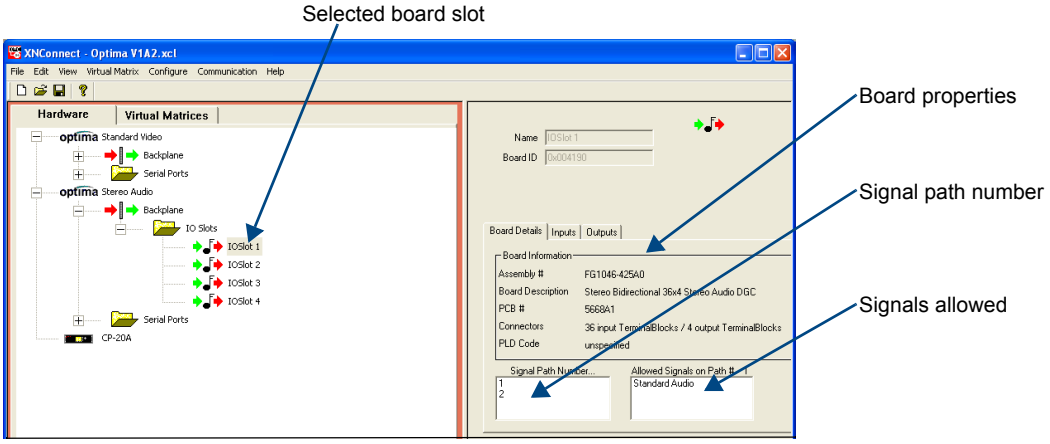
FIG. 85 Four step process for creating a new virtual matrix

The Physical Matrix

The virtual channels need to be assigned to the physical matrix in the Assign Signals to Matrices box. The list in this box shows only physical matrices that are capable of routing the selected signal.

To view the properties of a board:

1. Select the Hardware tab.
2. Expand the enclosure and backplane, and select the slot the board is in.

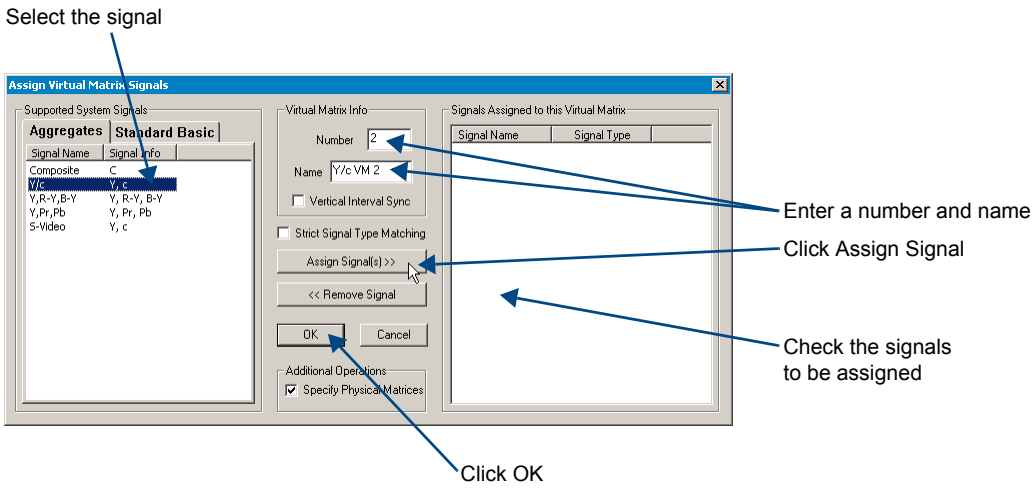


The information in the dialog boxes for the following section is based on the following scenario. A dual-connector 20x20 standard video board in slots 3 and 4 is reconfigured to switch 10x10 Y/c by creating a new VM 2 that switches 10 channels of "Y" and 10 channels of "c" using the previous "composite" channels.

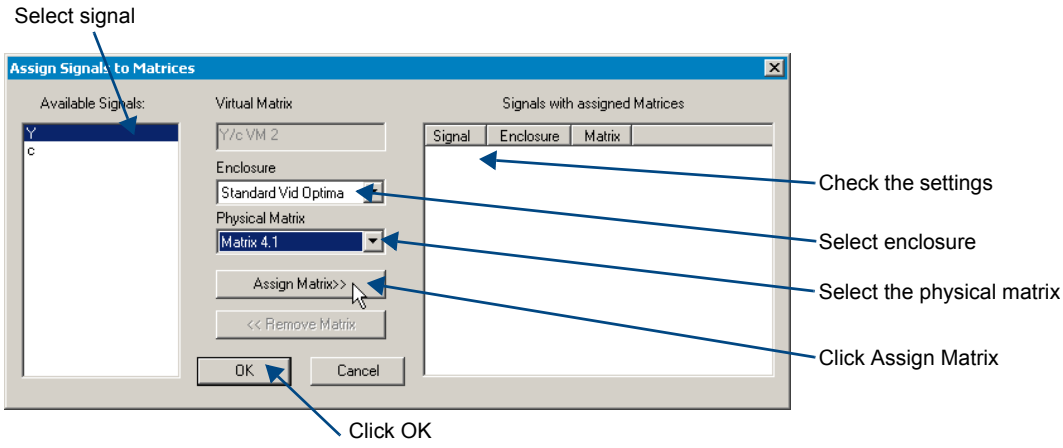
Note: *For additional information on creating virtual matrices, see the XNConnect Help file. To access the Help file topic for an open dialog box, press F1.*

To create a new virtual matrix:

1. From the Virtual Matrix menu, select Add Virtual Matrix.
   The Assign Virtual Matrix Signals dialog box opens.

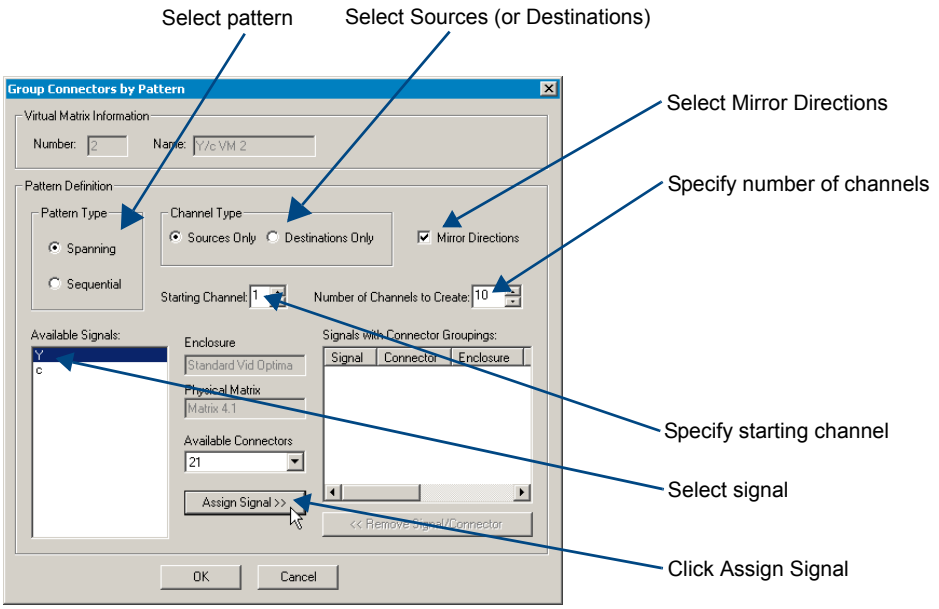


2. Under the Supported System Signals list (use either tab), select the signals for the new VM (to select multiple signals, hold the down the Control key) and click Assign Signal.
3. Under Virtual Matrix Info, enter a number and a unique name. Click OK.
   The Assign Signals to Matrices dialog box opens.



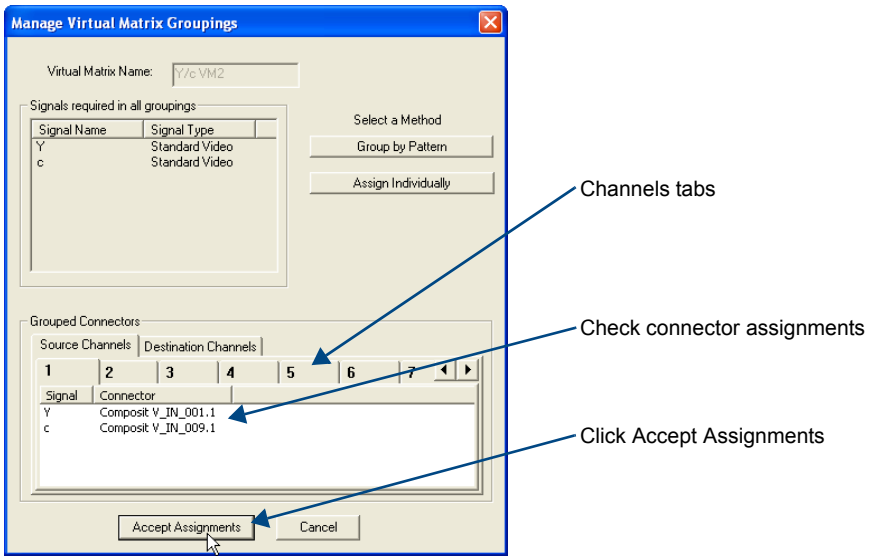
4. From the Available Signals box, select the signal.
5. If applicable – For a multiple-enclosure system, from the Enclosure drop down list, select the correct enclosure.
6. From the Physical Matrix drop down list, select the matrix (see "The Physical Matrix" on page 139).
7. Click Assign Matrix.

8. Repeat Steps 4 through 7 for additional signals.
9. Click OK to finalize the settings and close the dialog box.
10. From the Virtual Matrices view, right click the new virtual matrix and select Manage Connector Groupings.
    The Manage Virtual Matrix Groupings dialog box opens.
11. Under Select a Method, click Group by Pattern.
    (To group connectors individually, see the Help file.)
12. Specify the following parameters:
    - Under Pattern Type, select the pattern. (Spanning is the most common; for an explanation of the Spanning and Sequential patterns, see page 143.)
    - Under Channel Type:
      If the number of inputs equals the number of outputs, select Mirror Directions to apply the settings to both inputs and outputs.
      Or
      If the number is not equal, select Sources Only (Destinations Only will be selected in Step 18.)
    - In the Starting Channel field, enter the first channel number to be included.
    - In the Number of Channels to Create field, enter the number of channels needed for the first signal.



13. Select the first signal from the Available Signals list.
14. If applicable – If not using the entire set of connectors that are available for the signal, change the Starting Channel, Number of Channels to Create, and Available Connectors as necessary.
15. Click Assign Signal.
16. Repeat Steps 13 through 15 until all of the signals in the Available Signals list have been assigned to connectors, changing the values for the Starting Channel, Number of Channels to Create, and Available Connectors as necessary.
17. Click OK.
    The Manage Virtual Matrix Groupings dialog box opens again.

18. If applicable – If Mirror Directions was not selected in Step 12, repeat Steps 11 through 17 for the outputs, selecting Destinations in Step 12.
19. Under Grouped Connectors, check the virtual channel assignment for each connector by selecting the Source and Destination Channels tabs.



20. Click Accept Assignments if satisfied.
21. Load the configuring file onto the system; see page 128.
22. Using Save As (under the File menu), make a duplicate copy of the modified file with a new name and save it to the PC. (We *strongly* recommend making a duplicate copy every time the file is modified.)

Caution: *The system must not be actively switching when loading this information onto the system.*

Grouping Pattern Examples

For switching purposes, connectors can be grouped in two basic patterns of virtual channels, spanning and sequential. Explanations and examples of each follow.

Spanning Grouping Pattern

A spanning pattern is the most common method of grouping connectors for an Optima Distribution Matrix. When this pattern is selected, each of the component (standard) signals in an aggregate signal is assigned to a connector on an adjacent board. The same pattern is then repeated for the outputs.

Example

In the Y/c system in FIG. 86, the "Y" component is assigned to the input connectors on the first board and the "c" component to input connectors on the second board. The pattern is repeated for the output connectors. The stereo audio signal is assigned to the input and output connectors on the stereo audio board. The first input channel of VM 0 (audio-follow-video) includes both components of the Y/c signal (the first input connector on each video board), plus the stereo audio signal (the first input connector on the stereo board).

When you switch Input 1 on VM 0, the Y/c and stereo audio signals are routed simultaneously. On VM 0, any of the grouped Y/c input channels and their corresponding stereo pair input channel could be routed to any or all of the twenty available corresponding output channels.

Video and audio breakaway signals can also be routed by using virtual matrices that are configured to do so. In the example below, when you switch Input 1 on VM 1, the Y/c signal is routed. When you switch Input 1 on VM 2, the stereo audio signal is routed.

VM 0 = Y/c + Stereo Audio
VM 1 = Y/c
VM 2 = Stereo Audio

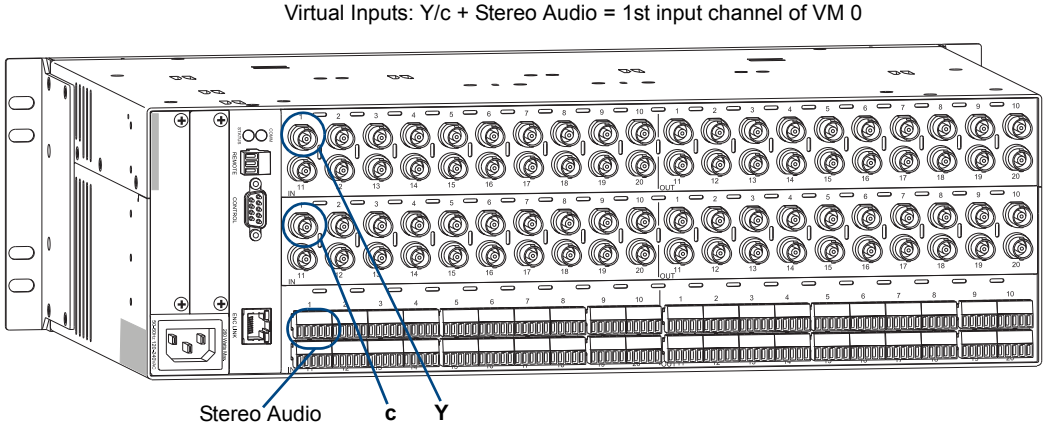


FIG. 86 Connectors grouped in a spanning pattern

Sequential Grouping Pattern

Although using a spanning pattern is more common for Optima Distribution Matrix enclosures, a sequential pattern can be used to group connectors. When this pattern is selected, each of the standard (component) signals in an aggregate signal is assigned to an adjacent connector on the same board.

Example

In the RGBS system in FIG. 87 the first input channel of VM 0 (audio-follow-video) includes each component of the RGBS signal, plus the stereo audio signal. The R, G, B, and S components are assigned to the first four input connectors on the wideband board. The stereo audio signal is assigned to the first input connector on the stereo audio board. When you switch Input 1 on VM 0, the RGBS and stereo audio signals are routed simultaneously. On VM 0 either of the grouped video input channels (RGBS) and their corresponding stereo pair channel can be routed to either or both of the available corresponding output channels.

Video and audio breakaway signals can also be routed by using virtual matrices that are configured to do so. In the example below, when you switch Input 1 on VM 1, the RGBS signal is routed. When you switch Input 1 on VM 2, the stereo audio signal is routed.

Note: *The DVI signals for the system in FIG. 87 switch on a separate virtual matrix.*

VM 0 = switches 2 channels of RGBS with Stereo Audio
VM 1 = switches 2 channels of RGBS
VM 2 = switches 8 channels of Stereo Audio

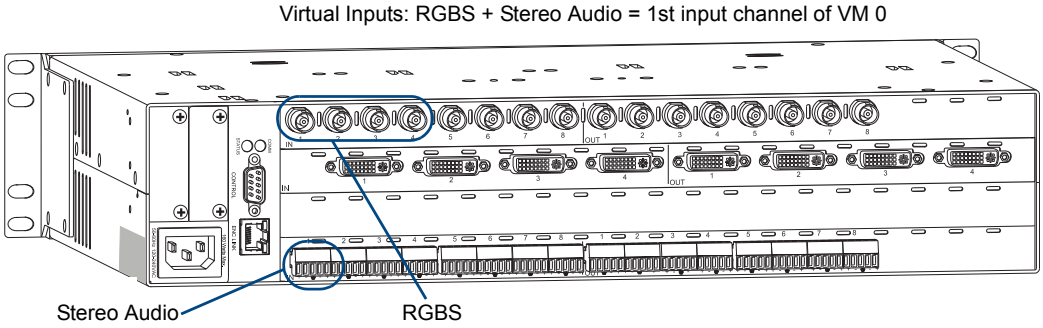


FIG. 87 Connectors grouped in a sequential pattern

Appendix D – Adding or Replacing I/O Boards

This appendix covers the procedure to add or replace an Optima input/output (I/O) board. The procedure for replacing boards is the same for 2 RU and 3 RU enclosures.

Input/output boards can be added to a partially filled enclosure to expand a system's capabilities or increase an enclosure's possible signal routings. An Optima 2 RU holds up to four boards (or two double-connector boards) while an Optima 3 RU holds up to six boards (or three double-connector boards).

Expansion boards (e.g., APWeb, XNNet boards) can also be added to an enclosure. For installation instructions for an expansion board, see the chapter for that specific board.

Important: *Adding or replacing boards should only be done by personnel trained to handle ESD sensitive parts and assemblies.*

Items Required

- Optima I/O board(s)
- Phillips #1 screwdriver
- ESD wristband and cord with alligator clip
- Updated configuration file (see "Configuration Requirements" below to determine if required)

Configuration Requirements

- If a board is replaced with the same type of board or if the system was configured for expansion with the same type of board, the configuration file does not need to be updated.
- If a board is added to a previously empty slot as part of an unplanned upgrade or if a board is replacing a different type of board, a CD has been included with an updated configuration file, which *must* be uploaded to the system (see page 152) for the new board to work.

8x8 DVI Board: *If installing or replacing this type of board, refer to the "EDID Programmer" appendix (see page 155) for information on EDID Programmer software.*

8x8 HDMI Board: *If installing or replacing this type of board, refer to the "HDMI I/O Board" chapter for additional setup information (see page 74).*

Before Starting

- Unplug the power cord on the rear of the enclosure.
- Multiple-enclosure system – label and disconnect link cables.
- Label and disconnect all signal cables and if applicable, any cables for external control.
- If the enclosure is in a rack, remove it and place on the work surface.

ESD Warning: *To avoid ESD (Electrostatic Discharge) damage to sensitive components, make sure you are properly grounded before touching any internal Optima materials. Use an ESD wristband and cord with an alligator clip attached to a good ground source.*

Removing I/O Boards

To remove an Optima I/O board (or blank board plate):

1 1a: Remove the five screws indicated (four from the top and one from the side).

1b: Remove the rack ear indicated (four screws).
Stand the enclosure on this side for Steps 2 and 3.

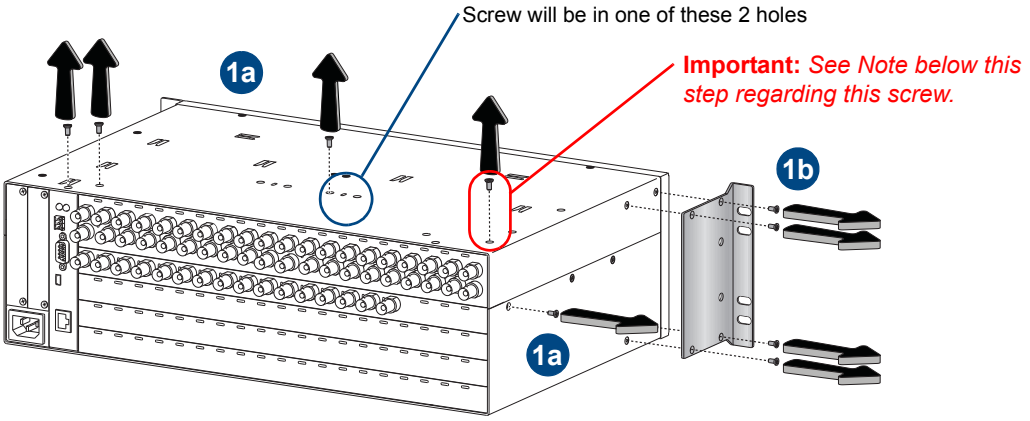


FIG. 88 Remove 5 screws and rack ear (4 screws)

Note: *If the screw circled in red in Step 1 is silver or if a silver screw was shipped with the new board(s), be sure to screw it into the same hole in Step 6 of the "Adding I/O Boards" procedure on page 151.*

2 2a: Remove the three screws indicated from the bottom of the enclosure.

2b: Remove the expansion plate (two screws).

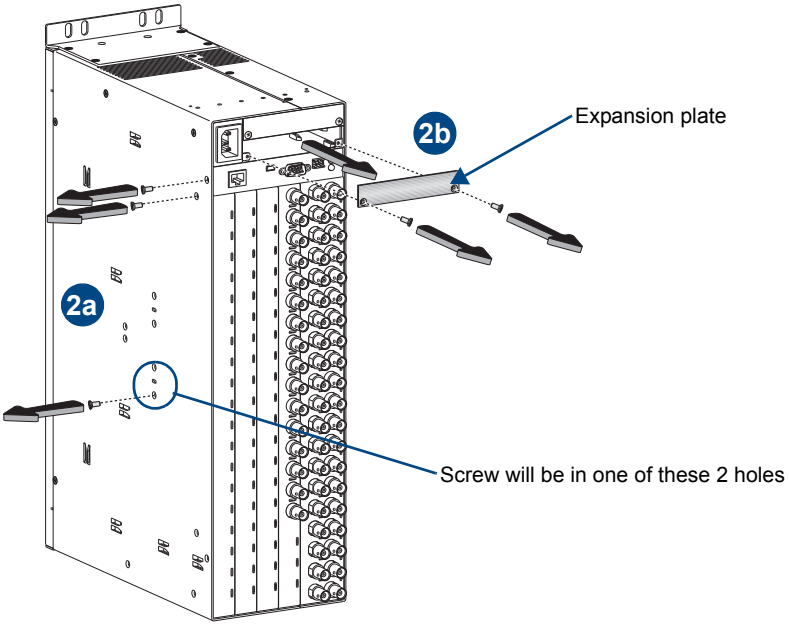


FIG. 89 Remove 3 screws and expansion plate (2 screws)

3 3a: Carefully pull the CPU/board unit straight out of the enclosure frame.

3b: Pull up on the CPU board, wiggling slightly to loosen it from the board unit. Tip the board unit to the left for Step 4.

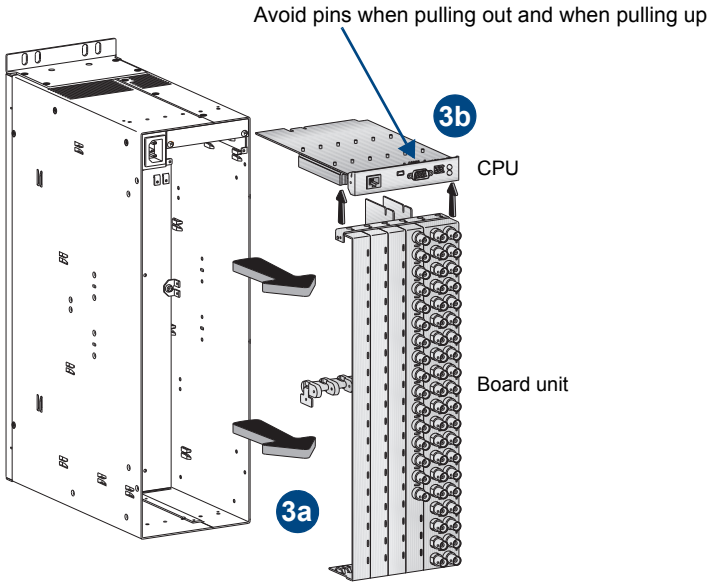


FIG. 90 Pull CPU/board unit straight out and remove CPU

4 4a: Remove the side screw.

4b: Remove the side slide-key. Stand the board unit on the slide-key end for Steps 5 and 6.

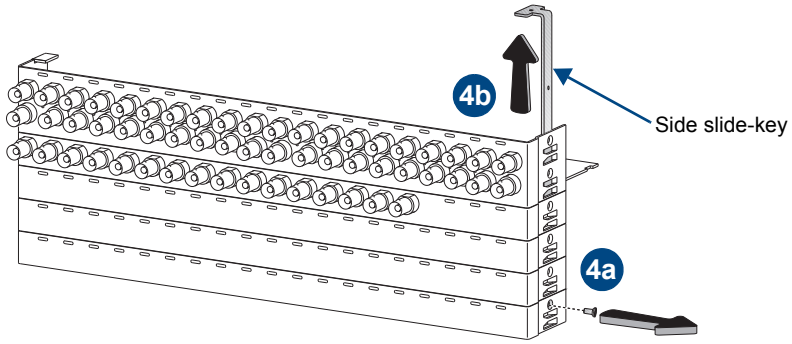


FIG. 91 Remove side screw and slide-key

5 Remove the two center slide-keys.

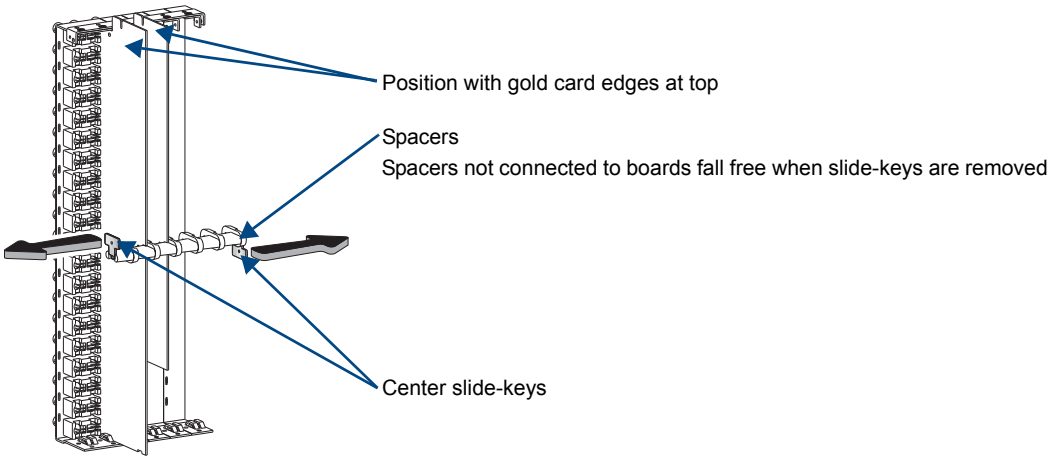

Position with gold card edges at top
Spacers
Spacers not connected to boards fall free when slide-keys are removed
Center slide-keys

FIG. 92 Remove center slide-keys (2)

6 6a: Remove the screw(s) indicated.

6b: Remove the board(s) **or** the blank board plate(s).
If removing a board, place the board in an ESD approved static shield bag and set aside.

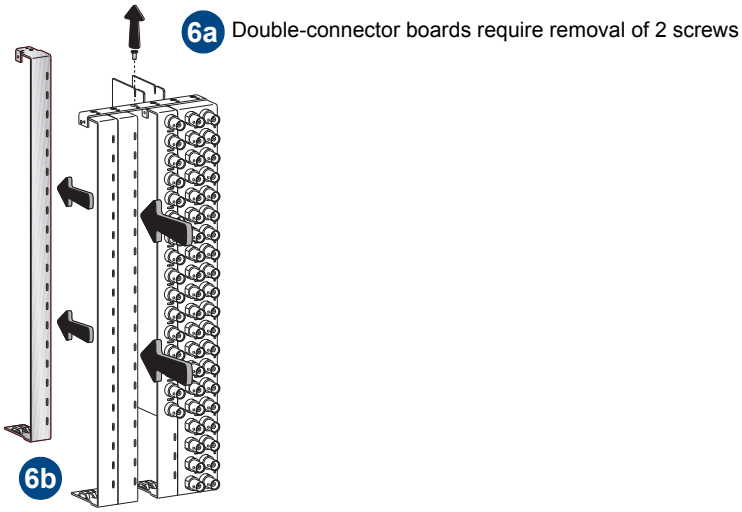


FIG. 93 Remove screw(s) and board or blank board plate

Important: *Be sure to install the new board(s) in the correct slot (see the "AutoPatch Connector Guide"). The board's location must match the system's configuration information. If a board is installed in the wrong slot, signal routing is affected.*

Adding I/O Boards

To add an I/O board:

1. 1a: Insert the new board(s).

   1b: Replace the screw(s) indicated. Tip the board unit to the left.

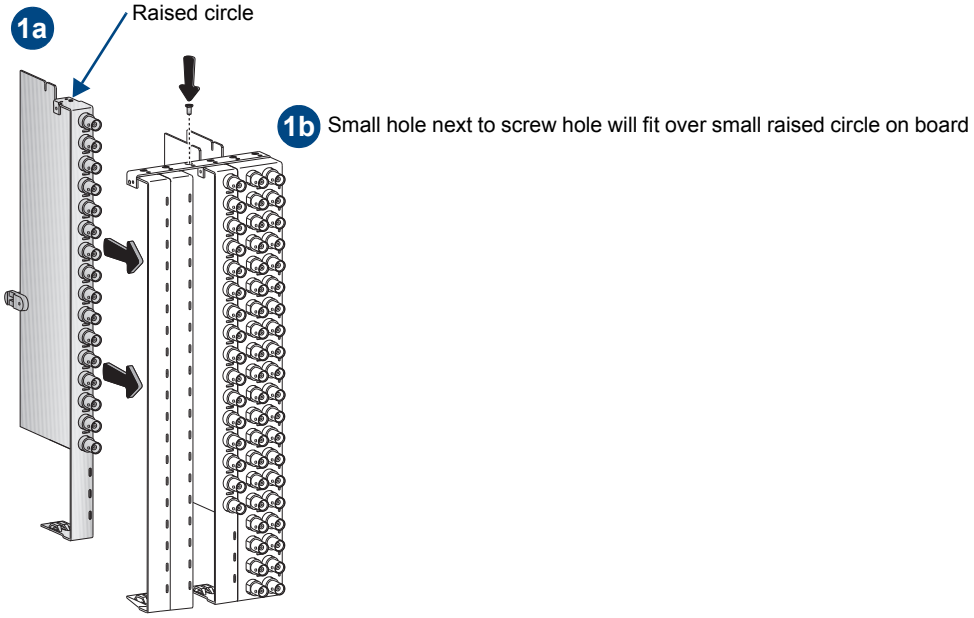


FIG. 94 Insert new board(s) and replace screw(s)

2. 2a: Replace the side slide-key.

   2b: Replace the side screw.

   2c. Line up the connectors on the CPU unit with the gold card edges on the board unit and push the units together until they snap into place. Stand the CPU/board unit on its slide-key end for Step 3.

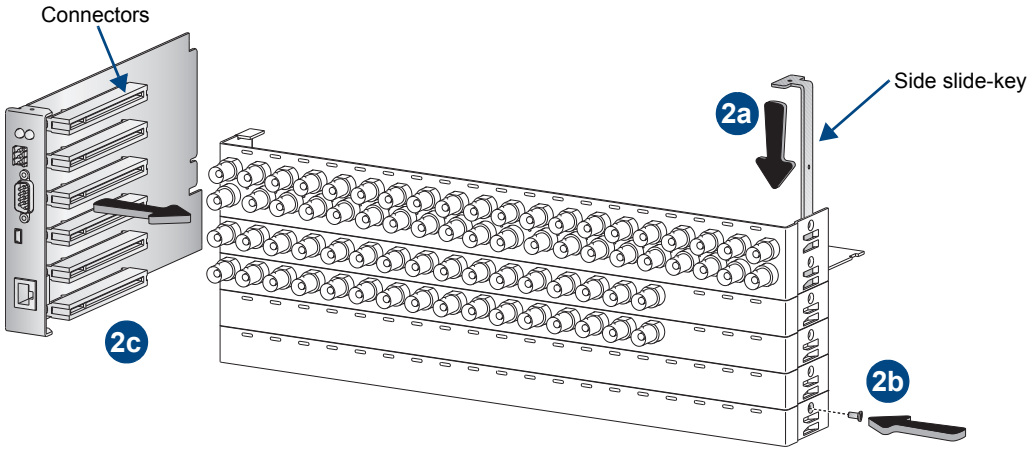


FIG. 95 Replace side slide-key and side screw; push board unit into place

3 3a: Insert the left slide-key (tab up) through the spacers, adding spacers as needed.

3b: Insert the right slide-key (tab down) under the left key and through the spacers.

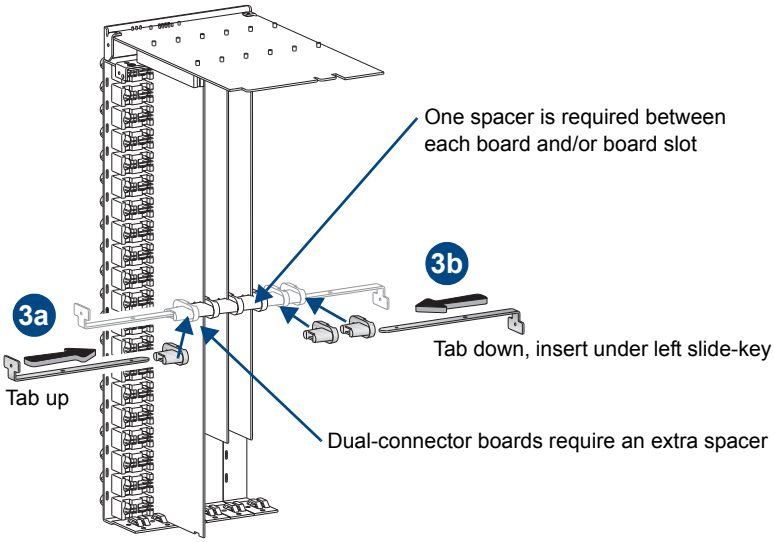

One spacer is required between each board and/or board slot
3b
3a
Tab down, insert under left slide-key
Tab up
Dual-connector boards require an extra spacer

FIG. 96 Insert left and right slide-keys through spacers

Note: *The number and placement of spacers varies per enclosure size and configuration. Boards and board slots each require a spacer; dual-connector boards require two spacers. Boards will be parallel when spacers are placed correctly.*

4 Line up the edge of the CPU on the board guide and push the CPU/board unit until it snaps into place.

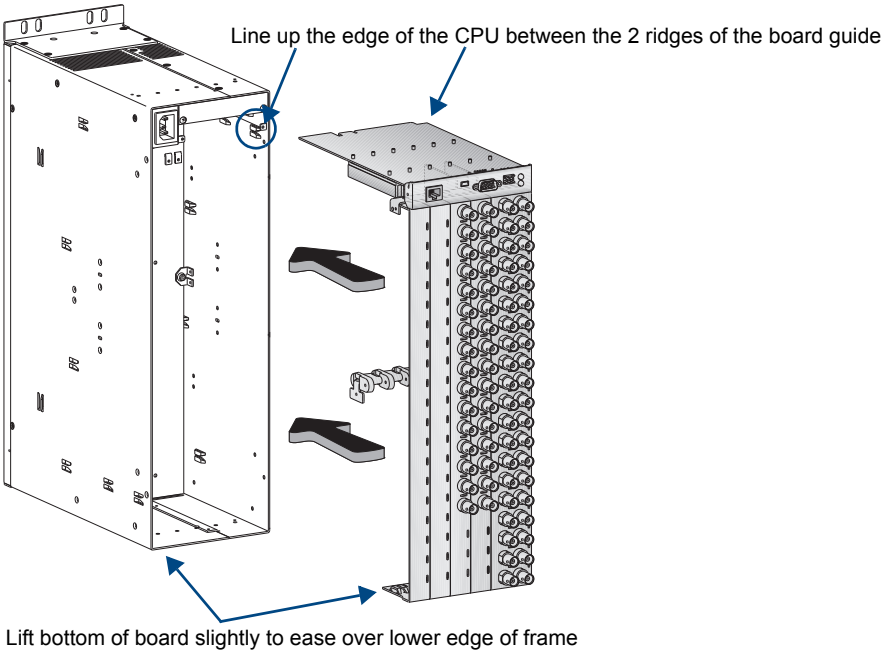

Line up the edge of the CPU between the 2 ridges of the board guide
Lift bottom of board slightly to ease over lower edge of frame

FIG. 97 Push CPU/board unit into place

5 5a: Replace the three screws indicated on the bottom of the enclosure.

5b: Replace the expansion plate (requires two screws).

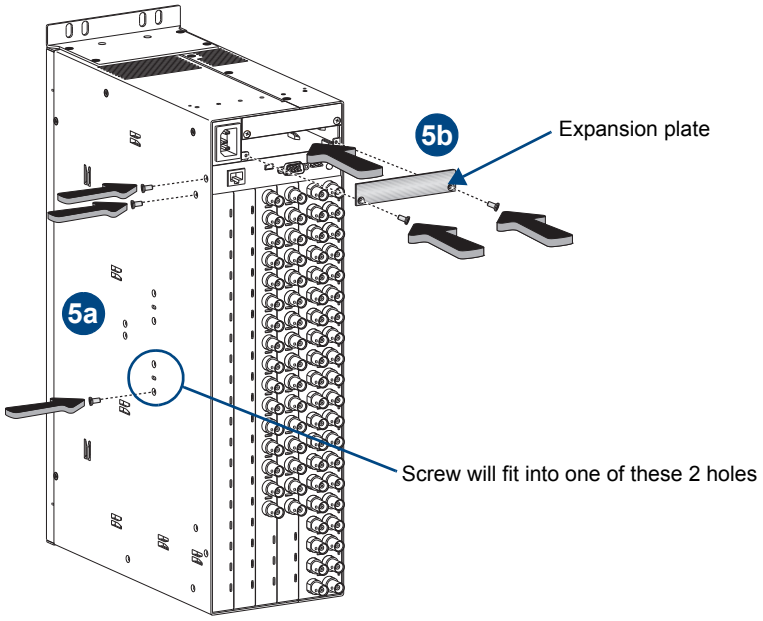


FIG. 98 Replace 3 screws and expansion plate (2 screws)

6 6a: Replace the five screws indicated (four on the top and one on the side).

6b: Replace the rack ear (requires four screws).

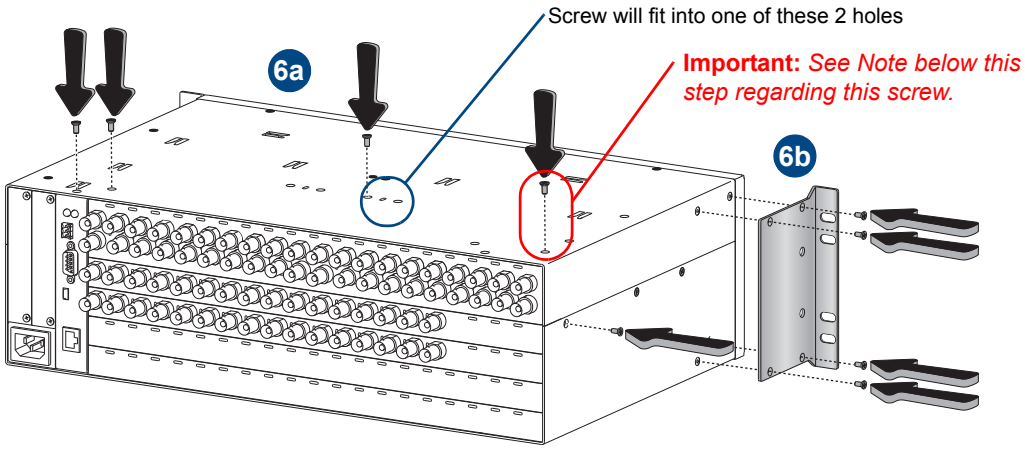


FIG. 99 Replace 5 screws and rack ear (4 screws)

Note: *If a silver screw was removed from this hole in Step 1 of the "Removing I/O Boards" procedure on page 146 or if a silver screw was shipped with the new board(s), be sure to screw it into the hole circled in red in Step 6.*

Completing the procedure:

- Re-install the enclosure in the rack.
- Reconnect all cables (including link cables in a multiple-enclosure system) that were disconnected in the removal procedure.
- If the system's configuration file does not need updating, reapply power to the enclosure and proceed with normal operations.
  Or
  If the system's configuration file requires updating, continue with the section below.

Important: *If the slot was previously empty or if the board type has changed, the system's configuration file must be updated before signals can be routed on the new board (see "Updating the System Configuration" below).*

Updating the System Configuration

The configuration for the Optima system may or may not need to be updated, depending on the type of board being installed.

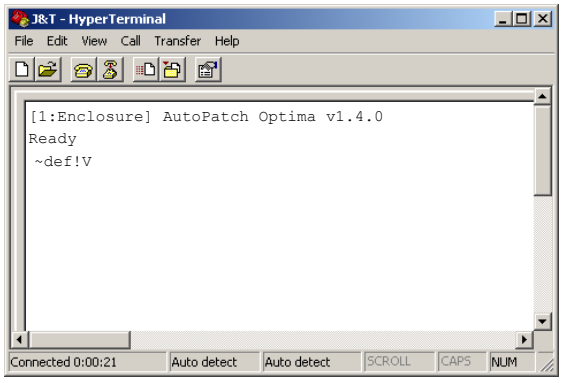
- If an input or output board is replaced with the same type of board or if the system was configured for expansion, the configuration file will not need to be updated.
- If an input or output board is added to a previously empty slot (an upgrade) in a system *not* configured for expansion, or if the replacement is a different type of board, the system's configuration file *must* be updated before the board will work. If the system requires a new configuration file, the file is provided on a CD and needs to be loaded using XNConnect.

Note: *We recommend keeping a copy of the former configuration file for reference.*

Important: *When loading any part of a configuration file, the matrix switcher must not be actively switching. You may want to disconnect any external controllers to ensure that no switches are executed during the loading of the file.*

To update the system configuration file:

1. Attach a PC to the Optima's serial port with an RS-232 null modem cable (pinout on page 29).
2. Open a terminal emulation program (e.g., HyperTerminal), and set the port settings to: baud rate = 9600, data bits = 8, stop bit = 1, parity = none, and flow control = none.
3. Cycle power on the Optima.
   A short splash screen appears (the first two lines in FIG. 100).



Note: *Your splash screen may differ. AMX reserves the right to change the contents and/or formatting of the splash screen without notice.*

FIG. 100 Short splash screen in HyperTerminal

4. Enter `~def!`
   Wait until a "`V`" appears (third line in FIG. 100 on previous page) to verify that the command is successful (this may take a few minutes).
5. Enter `~scrv3i5!` to view the VM (virtual matrix) configuration (example in FIG. 101).
   If the VM configuration is sufficient (i.e., the system is not supposed to have any VMs other than the ones listed), enter `~app!` to complete the configuration process (you do not need to finish Steps 6 through 12).
   Or
   If the VM configuration is not sufficient, then you *must* complete Steps 6 through 12.

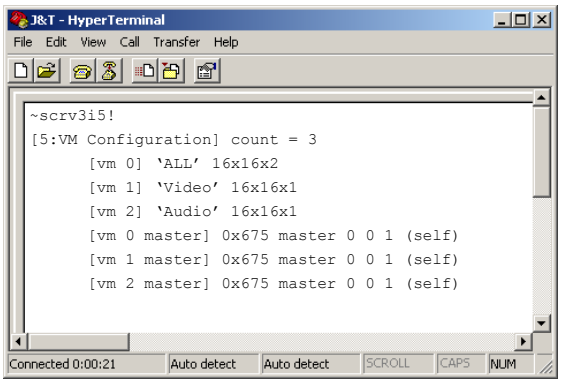


FIG. 101 Example of virtual matrix information on a system with video and audio

6. Install XNConnect from the *AMX AutoPatch CD* sent with the new board. (If XNConnect is already installed on the PC, we *strongly* recommend uninstalling the old version before installing a new version).
7. Open XNConnect.
8. From the Communication menu, select Change Comm Settings. Check the settings for the selected PC port and adjust if necessary (the default = COM 1, baud rate = 9600).
9. From the File menu, select Open.
10. Using the standard File Open dialog box, locate and open the .xcl configuration file that was sent with the new board. The default location is at C:\AutoPatch\Configuration Software<Version>\MyXCL folder.
11. For XNConnect version 2.4.0 and greater – from the Configure menu, select Configure All. The system automatically reboots all devices.
    Or
    For XNConnect versions prior to 2.4.0 – from the Configure menu, select Reboot All Devices.
12. Execute a test switch that includes a signal routed on the new board to ensure the system is working correctly; see page 36. (Repeat for any additional new boards.)
    If the test switch does not execute correctly, contact technical support (see page 38).

Appendix E – EDID Programmer

Applicability

EDID Programmer software is provided for re-programming the EDID EEPROM chips on the following boards if necessary:

- 8x8 DVI board (FG1046-659)
- 8x8 HDMI board (FG1046-614)

This software is available on the *AMX AutoPatch CD* or at **www.amx.com.**

Note: *The Optima 4x4 DVI board (FG1046-479) does not currently support the EDID Programmer.*

EDID Overview

EDID (Extended Display Identification Data) is a data structure established by the Video Electronics Standards Association (VESA) to enable plug-and-play support by enabling easy configuration of a computer's graphics subsystem based on the capabilities of the attached display device.

EDID information includes items such as the following:

- Manufacturer's name
- Product type
- Supported video resolutions and refresh rates
- Color space and filter chromaticity
- Detailed timing

When a computer is directly connected to a display device, it can use the display device's EDID information to determine an initial compatible video signal to send. With the computer's display controls, the user can modify this selection to another compatible signal based on the provided EDID information.

With High-Definition Multimedia Interface (HDMI) (which requires EDID on the display devices) using EDID information has extended beyond computers to other source devices, such as DVD players. As long as the source device sends a compatible signal, the plug-and-play feature will work.

Note: *The DVI board does not support HDCP required compliant signals.*

Matrix Switchers and EDID

Matrix switchers, such as the Optima, provide the ability to route one source signal to many potentially different types of display devices. As long as the source signal being routed is supported by all of the display devices, the result would be a good image on each display. If the source signal being routed is not supported by a display device, the result would be either a badly distorted image or no image at all.

To address these issues, the Optima 8x8 DVI board and Optima 8x8 HDMI board come with one EDID EEPROM chip per input connector, which has been pre-loaded with an AMX AutoPatch EDID set. This EDID set consists of some of the most common EDID settings in use today, including VESA Established Timings encompassing 8 resolutions at a variety of refresh rates and 8 additional Standard Timings encompassing 8 resolutions and refresh rate combinations (for DVI timing details, see page 63 and page 65; for HDMI, see page 71). In many cases, the matrix switcher can be used straight out of the box with no adjustments (see "Determining the Need for EDID Programming" on page 156).

The EDID Programmer software has been provided for cases where additional in-field programming of the EDID chips is needed. The EDID Programmer can be used for the following:

- Reading and saving EDID data in Hexadecimal from a device
- Writing EDID data to the Optima input connector's associated EDID EEPROM

Note: *Any analysis or editing of the EDID data necessary to support the equipment specific to your installation will need to be done separately prior to using the EDID Programmer. A variety of freeware tools can be found on the web to help with these tasks.*

Keep in mind that the EDID information for some equipment may not be compatible with the remaining equipment even with programming. In those cases, the signals will have limited routing options.

Tip: *If the signal from some of the equipment can only be routed to part of the destinations due to incompatible EDIDs, control for the system can be simplified by creating a separate virtual matrix (level) for the inputs and outputs involved.*

The remaining sections provide information on:

- Determining the need for EDID programming
- Installing the EDID Programmer
- Reading and saving EDID data from a destination device
- Writing EDID data to an Optima DVI or HDMI input connector
- Additional HDMI EDID files for handling audio concerns

Determining the Need for EDID Programming

Ideally the EDID analysis will have been completed during installation specification. If this was not possible but all of the system's devices are now available, the most effective way to proceed is to test if the DVI or HDMI signal from each of the source devices can be routed through the Optima to each of the destination devices. If they can, then EDID programming is *not* necessary.

Important: *Do not route a source to all destination devices at the same time, unless you know that the source will support all of the downstream sinks (see page 75). Otherwise, if the source does not support all downstream sinks, the result will be that all of the destinations do not display an image.*

The steps below use the CP-15 Control Panel to execute switches from each source device to all destination devices. If you are using a different method of control, adjust accordingly.

To determine if EDID programming is necessary:

1. Press the Function Key on the Control Panel.
2. From the Function menu, press the Select Key to choose Change.
   The available input and output keys turn blue.
3. Press the input key for the first DVI or HDMI input.
   The input key flashes white.
4. Press all of the output keys for the DVI or HDMI signal. Each output key illuminates white as it is pressed.
5. Press the Take Key to execute the one-to-all switch.
   The keys turn blue.
6. Check each destination display to verify that the picture is present, making note of any that are not.
7. HDMI connectors – we recommend clearing the connector's sink key cache (see page 83).
8. Repeat Steps 3 through 6 for each remaining DVI input or Steps 3 through 7 for HDMI inputs.
9. HDMI connectors – we recommend persisting the connector's empty sink key cache (see page 82).

Important: *If any destinations do not display a picture or the image is inaccurate (distorted, washed out pink or green, or flickers) or displays a format incompatibility message, analysis or editing of their EDID data may be necessary prior to using the EDID Programmer. A variety of freeware tools can be found on the web to help with these tasks.*

For HDMI, once any necessary EDID programming is completed, we recommend that you prime the system for InstaGate® technology, which will significantly reduce the HDCP latency and interruptions on all displays in the system (see page 81).

Tip: *If you are experiencing audio problems, it may be because you are trying to pass Dolby or DTS or high PCM frequency rates and the destination device does not support them. If you are experiencing video problems, it may be because you are trying to pass a video format that the destination device does not support. In either of these cases, reprogramming the EDID may help resolve the problem.*

If EDID programming is necessary, you have two options.

- Install the EDID Programmer. Read the EDID from the destination device and write it to the DVI or HDMI input connector.
- Install the EDID Programmer. Check the AutoPatch_EDID_Library file on the *AMX AutoPatch CD* or at **www.amx.com** (search for EDID Library) to determine if one of the custom EDID files meets the needs of the equipment. (The custom EDID files are variants of base EDIDs.) Write the custom EDID file to the DVI or HDMI input connector.

Installing the EDID Programmer

PC System Requirements for EDID Programmer v1.2.0

- ❑ Windows XP Professional©
- ❑ Minimum Hardware: 166 MHz, 128 MB RAM, 20 MB of free disk space*, 800x600 display, serial port, video card with dual outputs**
- ❑ Recommended Hardware: 2.0 GHz, 512 MB RAM*

* The installation process requires 20 MB of disk space for the EDID Programmer installer. Once installed, the EDID Programmer requires 5 MB of disk space.

** We strongly urge the user *not to use video cards with DMS-59 connectors*. Video cards with DMS-59 connectors have been shown to fail consistently and, in the worst case, *can corrupt an EDID data file*. A laptop PC with an HDMI, DVI, or VGA output connector is a good solution. Cards with 2 HDMI connectors, 2 DVI connectors, 2 VGA connectors, or cards with a combination of any two of the three (HDMI, DVI, and VGA) are also acceptable.

To install EDID Programmer software:

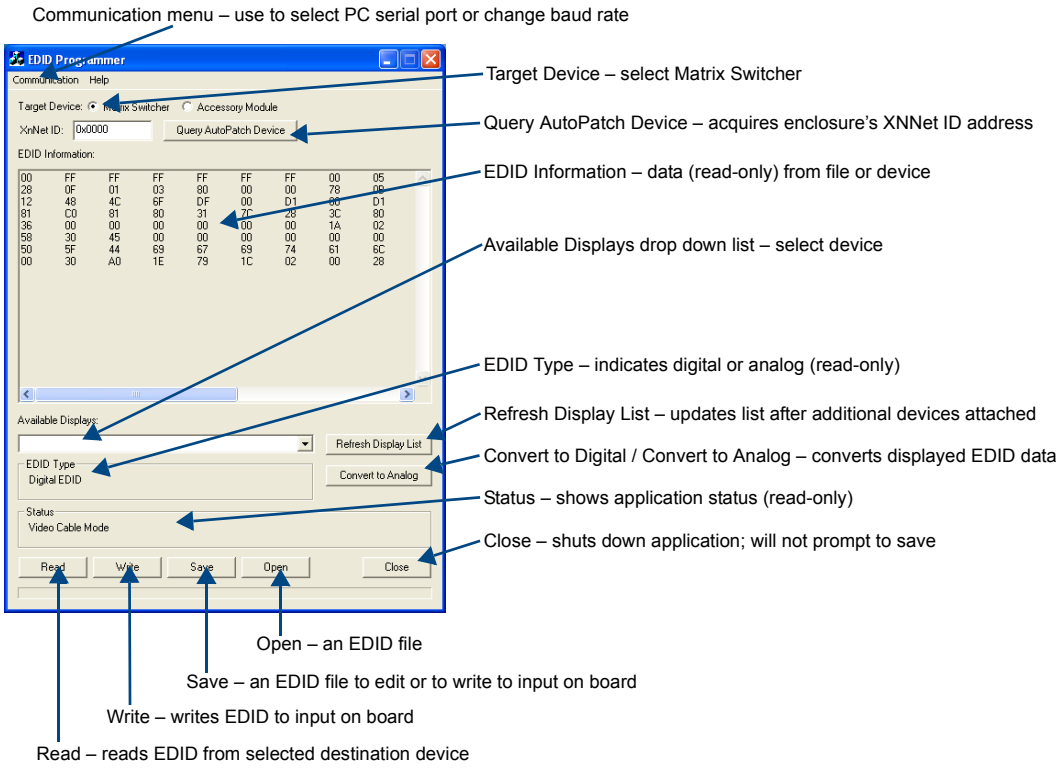
1. Locate and open the installer <EDIDProgrammer_1.2.exe> on the *AMX AutoPatch CD* or at **www.amx.com**.
2. Follow the directions in the wizard.

Reading and Saving EDID Data from a Destination Device

Tip: *The Save button in the EDID Programmer can be used to save the EDID information as an .edid file, which can be opened as a text file (click the Open button) and edited or opened and written to an input (click the Write button).*

To read and save EDID data from a destination device:

1. On the PC, open the EDID Programmer.


Communication menu – use to select PC serial port or change baud rate
Target Device – select Matrix Switcher
Query AutoPatch Device – acquires enclosure's XNNet ID address
EDID Information – data (read-only) from file or device
Available Displays drop down list – select device
EDID Type – indicates digital or analog (read-only)
Refresh Display List – updates list after additional devices attached
Convert to Digital / Convert to Analog – converts displayed EDID data
Status – shows application status (read-only)
Close – shuts down application; will not prompt to save
Open – an EDID file
Save – an EDID file to edit or to write to input on board
Write – writes EDID to input on board
Read – reads EDID from selected destination device
Communication
Help
Target Device:
Matrix Switcher
Accessory Module
XnNet ID:
0x0000
Query AutoPatch Device
EDID Information:
Available Displays:
Refresh Display List
EDID Type
Digital EDID
Convert to Analog
Status
Video Cable Mode
Read
Write
Save
Open
Close

2. Connect a DVI or HDMI cable to the PC using the PC's spare monitor port (if the PC has a DVI port and the destination device's port is HDMI, use a DVI-to-HDMI cable adapter; if your laptop has an HD-15 [VGA] port, see "Using Cable Adapters" below).
3. Connect the open end of the DVI or HDMI video cable to the destination device (typically a monitor) from which the EDID information needs to be read.
4. Click the Refresh Display List button to update the Available Displays drop down list.
5. From the Available Displays drop down list, select the destination device from which you need to read the EDID.
6. Click the Read button to read the EDID information. The results display in the read-only area.
7. Click the Save button (select location, enter file name, and click Save).
   Leave the EDID Programmer open for instructions on writing the EDID to the Optima.
8. Disconnect the DVI or the HDMI cable from the PC and from the destination device.

Using Cable Adapters

If your laptop has an HD-15 (VGA) port, you can use a DVI-to-VGA cable to connect the laptop's HD-15 video port to a DVI cable attached to a destination device's DVI port. Alternatively, use the following combination of adapters with a DVI-D cable to connect the laptop to the destination device. The setup of adapters and DVI-D cable in FIG. 102 passes EDID information but *not* video signals.

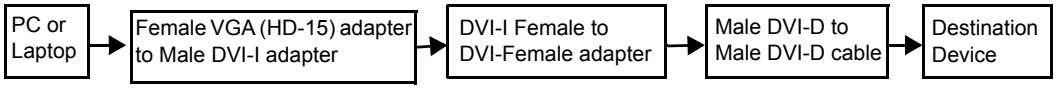

PC or Laptop
Female VGA (HD-15) adapter to Male DVI-I adapter
DVI-I Female to DVI-Female adapter
Male DVI-D to Male DVI-D cable
Destination Device

FIG. 102 Connecting an HD-15 (VGA) port to a DVI port

Writing EDID Data to a DVI or HDMI Input Connector:

To write EDID data to the EDID chip for a DVI or HDMI input connector:

1. Attach a null modem serial cable without hardware flow control to the Control port (DB-9) on the Optima. Use a serial cable that matches the pin diagram in FIG. 103 for RS-232. The Control port uses pins 2, 3, and 5 only.

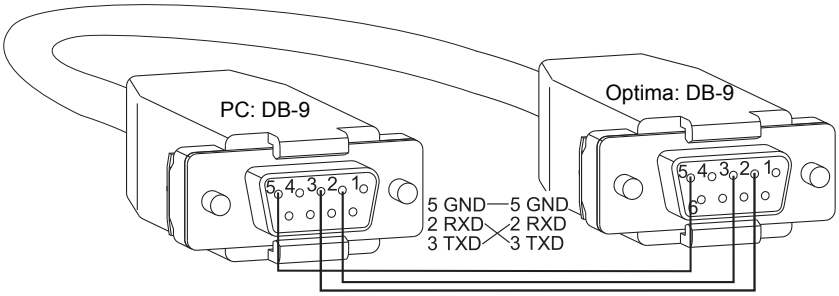


FIG. 103 RS-232 pinout

2. Attach the open end of the serial cable to the PC that the EDID Programmer will be opened on.
3. If necessary – From the Communication menu, select Change Settings to change the baud rate for the PC's serial port, which *must* match the baud rate for the Optima. The recommended (default) settings for serial communication with an Optima are in the table to the right.
4. Apply power to the enclosure.
5. On the PC, open the EDID Programmer.
6. For the Target Device, select the Matrix Switcher option.
7. Click the Query AutoPatch Device button to obtain the XNNet address from the enclosure.

Optima Serial Port Settings	
Baud Rate	9600
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

Note: *If your laptop has an HD-15 (VGA) port, see "Using Cable Adapters" on page 158 for information on connecting an HD-15 (VGA) port to a DVI port.*

8. Attach a DVI or HDMI cable to the PC using the PC's spare monitor port (if the PC has a DVI port and the Optima input is HDMI, use a DVI-to-HDMI cable adapter).
9. Attach the open end of the DVI or HDMI cable to the DVI or HDMI input connector on the Optima that requires programming.
10. Save the board's EDID default as a backup (assumes the board has factory default EDID programming).
    - Click the Refresh Display List button.
    - Select the device.
    - Click the Read button.
    - Click the Save button (select location, enter file name, and click Save).

11. Click the Open button to select the .edid file to be written to the DVI or HDMI input connector.
12. Click the Write button to write the EDID information to the DVI or HDMI input connector.
13. If applicable – Repeat any of the steps necessary for any of the other DVI or HDMI input connectors.
14. Disconnect the DVI or HDMI cable from the PC and from the Optima DVI or HDMI board.
15. Disconnect the serial cable from the PC and from the Optima enclosure.

Custom HDMI EDID Files for Handling Audio Concerns

Since an Optima with an HDMI board(s) will be installed between multiple source and sink devices which often support different video and audio formats, it is possible that neither the video nor the audio routed by the AutoPatch switcher can be displayed on one or more of the destination devices. Customizing the EDID content at the Optima input channels is one way to be sure that the formats provided by the source are compatible with most/all of the destination devices.

The following files are supplied*:

The first group of files use 1080p (VIC 16) as the preferred (native) video resolution.

File Name	EDID File Checksum	Monitor Name	Description
AMX_HDMI1_A1.edid	8D	AMX_HDMI1_A1	Default shipped EDID content on each input. Supports audio up to 192 k for L-PCM, 48 kHz Dolby (5.1), and 48 kHz DTS (5.1).
AMX_HDMI1_A1_basicAudio.edid	EE	AMX_0300_001	Supports basic audio only (L-PCM 32 k, 44.1 k, and 48 k).

The second group of files use 720p (VIC 4) as the preferred (native) video resolution.

File Name	EDID File Checksum	Monitor Name	Description
AMX_HDMI1_A1_720p.edid	A2	AMX_0301_002	Supports audio up to 192 k for L-PCM, 48 kHz Dolby (5.1), and 48 kHz DTS (5.1).
AMX_HDMI1_A1_720p_basicAudio.edid	92	AMX_0300_003	Supports basic audio only (L-PCM 32 k, 44.1 k, and 48 k).

Troubleshooting Example

Problem:

One example is when a source device that selects the highest supported video and audio formats is installed with a sink whose input is limited to 720p and basic audio. Using the default shipping EDID content would result in 1080p and possibly either 192 k stereo, Dolby 5.1, or DTS 5.1 audio arriving at the sink when a route was completed through the Optima. The end result would probably be neither video nor audio.

Solution:

To fix this problem, use the EDID Programmer to reprogram the Optima input's EDID to the content supplied in one of the files listed above. For the example given, the best choice would be the file named AMX_HDMI1_A1_720p_basicAudio.edid.

* These files are located in the AutoPatch_EDID_Library file on the *AMX AutoPatch CD* or at **www.amx.com** (search for EDID Library).

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